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LISINOPRIL VERSUS AMLODIPINE IN HYPERTENSIVE PATIENTS SUBJECTED FOR ANESTHESIA

By

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ABSTRACT

Background: Hypertension is regarded as an additional risk factor during anesthesia. Antihypertensive usage and its implications during perioperative period have unpredictable effects on hemodynamics.

Objectives: To evaluate the effect of anesthesia (general) on hemodynamics in hypertensive patients chronically treated with amlodipine in comparison to patients on lisinopril.

Patients and Methods: This study included sixty adults, of both sexes, aged between 40 and 60 years old, controlled hypertensive with amlodipine or lisinopril, randomly divided into four equal groups. Group AG: On amlodipine subjected for general anesthesia, Group AS: On amlodipine subjected for spinal anesthesia, Group LG: On lisinopril subjected for general anesthesia, Group LS: On lisinopril subjected for spinal anesthesia, scheduled for elective lower limb or lower abdominal surgeries. Monitoring of arterial blood pressure (SBP, DBP, MAP), HR, oxygen saturation were recorded as pre-operative basal reading , immediately after induction, every 5 minutes for 20 minutes, then every 15 minutes till the end of operation. Hypertension was considered when increase >20% from basal reading, and hypotension when decrease <20% from basal reading.

Results: There were statistically significant differences as regard systolic, diastolic, mean arterial blood pressure between group AS and group LS with significant decrease in SBP, DBP, MAP more in group LS after spinal injection, also there were statistically significant differences as regard systolic, diastolic, mean arterial blood pressure between group AG and group LG with significant decrease in SBP, DBP, MAP more in group AG after induction of anesthesia. Also, there was astatistically significant difference as regard heart rate between AS and LS groups with significant decrease in HR more in group AS after spinal injection than LS group, Statistical significant difference was noticed in heart rate between AG and LG groups with significant decrease in HR more in group LS after induction of anesthesia.

Conclusion: Amlodipine was better than lisinopril in its effect regarding hemodynamics in hypertensive patients subjected for anesthesia.

Key words: Hypertension, amlodipine, lisinopril.

INTRODUCTION

Hypertension is the most common disease seen in primary care, and it remains one of the most important preventable contributors to disease and death *(James et al. 2014)*. Withdrawal of antihypertensive drugs could lead to withdrawal symptoms like rebound hypertension, tachyarrhythmia, nervousness, anxiety, and exaggeration of angina and occasionally myocardial infarction and sudden death *(Karachalios et al., 2005)*. A hypertensive patient can undergo routine stressors like infection, trauma and surgery. During surgery, the manipulation of blood pressure (BP) is crucial for the conduct of the surgery as well as to prevent complications of surgery. Hypertension is regarded as an additional risk in anaesthesia *(Prys - Roberts et al., 1991)*.

There are different theories regarding the use of antihypertensive drugs, whether to continue the same anti-hypertensives prior to surgery or discontinue and starton different anti-hypertensives. One of the recommendation is that if the diastolic blood pressure (DBP) is ≤110mmHg and stable, surgery may proceed without delay provided the perioperative blood pressure is monitored closely, and hyper or hypotensive episodes are treated appropriately *(Comfere et al., 2005)*. Another approach is if the DBP is >100mmHg, with or without antihypertensive therapy, surgery should be deferred until the blood pressure is under better control *(Schirmer and Schurmann 2007)*.

AIM OF THE WORK

The Primary outcome was evaluation of the effect of Lisinopril versus amlodipine on the hemodynamics of hypertensive patients undergoing lower abdominal or lower limb surgery under general or spinal anesthesia, and the secondary outcome was evaluation of changes in oxygen saturation in both groups.

PATIENTS AND METHODS

After obtaining approval of the Ethical committee of al-Azhar Faculty of Medicine and informed written consent from each patient, this prospective ,randomized, double-blind clinical study was conducted at Al-Azhar University (Damietta Hospital) on 60 patients, controlled hypertensive, of both sexes, aged 40-60 years, ASA II, on single regular antihypertensive medications (for at least six months duration) either lisinopril or amlodipine, scheduled for elective lower abdominal or lower limb surgeries under general and spinal anesthesia expected not to exceed 2 hours. Duration of the study was from May 2017 to October 2018. Exclusion criteria: patients on combined theraby, presence of complications of hypertension (Target organ damage), associated severe systemic illness as severe hepatic, cardiac, renal and respiratory illness, discontinuation of antihypertensive drugs during the past 6 months till the time of the surgical operation, uncontrolled hypertension, pregnant subjected for cesarean section. Patients were randomly divided into four equal groups using computer generated and opaque sealed envelope method. Group AG:

Hypertensive patients on amlodipine subjected for general anesthesia, Group LG: Hypertensive patients on lisinopril subjected for general anesthesia, Group AS: Hypertensive patients on amlodipine subjected for spinal anesthesia and Group LS: Hypertensive patients on lisinopril subjected for spinal anesthesia. General anesthesia was conducted by Fentanyl (2 mcg/kg/dose) – Propofol (2 mg/kg/dose) – rocuronium (0.6 mg/kg) for facilitation of endotracheal intubation through IV injection then maintained on Isoflurane (MAC of 1.2). Spinal anesthesia was conducted by intrathecal 15 mg hyperbaric bupivacaine 0.5% plus 25µg fentanyl with total volume of 3.5ml, spinal puncture was performed through a midline approach after skin infiltration with local anesthesia (3ml lidocaine 2%); at L4-L5 interspace level using 25G Quincke spinal needle. Monitoring of arterial blood pressure (systolic, diastolic, mean), heart rate and oxygen saturation was recorded as pre-operative basal reading , immediately after induction, every 5 minutes for 20 minutes, then every 15 minutes till the end of operation. Hypertension was considered when increase >20% from basal reading, and hypotension when decrease <20% from basal reading. Monitoring included continuous electrocardiogram, heart rate, SPO2 and noninvasive blood pressure, using (NIHON Kohen) Monitor.

Statistical analysis:

Data entry and statistical analyses were performed using SPSS (statistical package of social sciences) version 21 (SPSS Inc., Chicago, IL, USA). Continuous normally distributed data were expressed in mean and standard deviation. The quantitative data were examined by Kolmogorov Smirnov test for normality of data. Independent sample t test (student t test) was used for continuous normally distributed data. Analysis of variance (ANOVA) test was used for multivariate continuous normally distributed data. Statistical significance was considered when probability (P) value was less than or equal to 0.05.

RESULTS

Age in studied populations ranged from 40 to 60 years, the mean age was 48.41 years, and there was non-significant difference between studied populations. In addition, 35 out of 60 patients (58.3%) were males and 25 (41.7%) were females and there was no significant difference between studied groups (male gender represented 60.0%, 53.3%, 66.7% and 53.3% of AS, AG, LS and LG groups respectively). As regard to type of surgery, it was lower limb surgery in 36 patients (60.0%), and abdominal surgery in 24 (40.0%), and there was statistically significant decrease of abdominal surgery in AS and LS groups (20.0% in each group) when compared to either AG (66.7%) or LG group (53.3%) (Table 1).

Table (1): Demographic data (Mean±SD)

Parameters \ Groups		AS	AG	LS	LG	P value
Age (year)		47.46±66.04; 40-59	51.33±5.15; 42-60	47.80±5.82; 40-59	47.06±5.03; 40-55	0.14(ns)
Sex	Male	9(60.0%)	8(53.3%)	10(66.7%)	8(53.3%)	0.86
	Female	6 (40.0%)	7(46.7%)	5(33.3%)	7(46.7%)	
Type of Surgery	Lower limb	12(80.0%)	5(33.3%)#	12(80.0%)	7(46.7%)#	0.014*
	Abdominal	3(20.0%)	10(66.7%)	3(20.0%)	8(53.3%)	

#: Significant decreases in AG and LG groups when compared to AS or LS groups; *: significant difference

There were statistically significant differences in systolic blood pressure between AS and LS groups after spinal injection at 10m, 15m,35m, 50m, 65m, with more decrease in LS than AS group. Also, there were statistically significant difference between AG and LG groups after induction of general anesthesia were noticed especially at 10m, then after 35 and 50m with more decrease in LG than AG group (Table 2).

Table (2): Systolic blood pressure among studied populations at different points of time (Mean ± SD)

Parameters \ Groups	AS	LS	P value	AG	LG	P Value
Basal	120.27 ± 3.95	120.20 ± 5.54	0.97	123.27 ± 7.46	121.33 ± 7.10	0.47
At 1 min	117.40 ± 2.29	117.73 ± 6.36	0.85	121.40 ± 7.18	117.87 ± 5.59	0.14
At 5 min	107.80 ± 3.69	113.06 ± 6.91	***0.04****	113.07 ± 6.91	109.73 ± 6.82	0.19
At 10 min	112.33 ± 3.04	108.40 ± 4.64	***0.01****	125.53 ± 6.59	115.80 ± 6.04	***0.001**#*
At 15 min	112.13 ± 3.18	108.00 ± 3.84	***0.003****	123.60 ± 4.78	119.27 ± 6.64	***0.05**#*
At 20 min	112.93 ± 4.73	105.73 ± 3.75	***0.001****	122.13 ± 4.81	119.27 ± 4.48	0.10
At 35 min	112.87 ± 5.13	105.47 ± 3.64	***0.001****	122.07 ± 6.08	114.27 ± 5.16	***0.001**#*
At 50 min	111.80 ± 6.54	105.07 ± 5.30	***0.004****	119.80 ± 5.94	114.20 ± 5.85	***0.015**#*
At 65 min	109.80 ± 6.56	104.93 ± 5.92	***0.04****	119.33 ± 5.96	116.40 ± 5.90	0.18
At 80 min	102.67 ± 5.61	100.07 ± 7.83	0.30	119.73 ± 6.79	117.50 ± 5.67	0.34
At 95 min	96.90 ± 5.61	99.90 ± 9.63	0.40	120.57 ± 7.73	115.58 ± 4.12	0.06
At 110 min	96.60 ± 2.30	96.80 ± 12.93	0.97	118.75 ± 3.85	117.50 ± 5.09	0.60

*: significant difference between AS and LS groups; #: significant difference between AG and LG groups; $: Significant variance between studied groups when < 0.05

There were statistically significant differences in diastolic blood pressure between AS and LS groups after spinal injection at 10m, 15m, 20m, 35m, 50m, with more decrease in LS than AS group. Also, there was statistically significant difference between AG and LG groups after induction of general anesthesia at 10m, with more decrease in LG than AG group (Table 3).

Table (3): Diastolic blood pressure among studied populations at different points of time (Mean±SD)

Groups / Parameters	AS	LS	P Value	AG	LG	P Value
Basal	76.07 ± 3.20	77.53 ± 3.38	0.23	77.73 ± 6.15	76.33 ± 4.89	0.49
At 1min	75.13 ± 1.64	76.27 ± 3.71	0.28	76.13 ± 5.73	74.40 ± 4.70	0.37
At 5 min	71.13 ± 1.77	71.53 ± 4.91	0.76	71.00 ± 7.18	73.53 ± 3.80	0.23
At 10 min	71.00 ± 3.05	67.13 ± 4.39	***0.009****	77.87 ± 6.21	70.07 ± 4.86	***0.001**#*
At 15 min	74.60 ± 2.85	66.73 ± 3.97	***0.001****	75.67 ± 5.88	74.87 ± 5.07	0.69
At 20 min	73.87 ± 3.68	65.07 ± 3.67	***0.001****	73.67 ± 6.55	73.20 ± 5.68	0.83
At 35 min	72.53 ± 4.44	63.87 ± 4.70	***0.001****	71.93 ± 5.68	70.93 ± 5.73	0.63
At 50 min	71.40 ± 4.17	64.20 ± 5.16	***0.001****	71.33 ± 6.24	70.53 ± 5.13	0.70
At 65 min	66.87 ± 5.01	65.07 ± 5.81	0.37	72.07 ± 7.88	71.53 ± 4.82	0.82
At 80 min	65.60 ± 5.58	64.87 ± 5.71	0.72	72.47 ± 7.62	72.93 ± 6.43	0.86
At 95 min	61.80 ± 7.54	65.45 ± 7.33	0.27	74.50 ± 8.31	71.92 ± 5.65	0.37
At 110	61.60 ± 3.65	63.80 ± 8.34	0.60	74.17 ± 8.28	74.00 ± 4.47	0.96

*: significant difference between AS and LS groups; #: significant difference between AG and LG groups;

Mean arterial blood pressure showed statistically significant differences between AS and LS groups after spinal injection at 10m, 15m, 20m, 35m, 50m,65m, 80m, with more decrease in LS than AS group. Also, there were statistically significant differences between AG and LG groups after induction of general anesthesia at 50m, with more decrease in LG than AG group (Table 4).

Table (4): Mean arterial blood pressure among studied populations at different points of time (Mean±SD)

Groups / Parameters	AS	LS	P Value	AG	LG	P Value
Basal	90.80 ± 2.90	91.76 ± 3.79	0.44	92.91 ± 6.23	91.33 ± 5.45	0.46
At 1min	89.22 ± 1.37	90.09 ± 4.18	0.45	91.22 ± 5.80	88.89 ± 4.72	0.23
At 5 min	83.36 ± 1.73	84.84 ± 4.70	0.26	85.02 ± 6.13	85.60 ± 4.22	0.76
At 10 min	83.33 ± 3.06	81.40 ± 1.68	***0.044****	84.13 ± 3.58	81.07 ± 4.71	0.06
At 15 min	87.20 ± 2.34	79.60 ± 1.64	***0.001****	84.13 ± 5.48	83.00 ± 4.94	0.55
At 20 min	85.20 ± 2.78	78.40 ± 1.96	***0.001****	82.80 ± 2.51	82.13 ± 4.16	0.59
At 35 min	82.53 ± 4.12	76.20 ± 1.97	***0.001****	82.20 ± 2.60	83.20 ± 4.75	0.48
At 50 min	79.00 ± 5.00	74.13 ± 2.26	***0.003****	83.07 ± 1.33	80.53 ± 4.37	***0.041**#*
At 65 min	76.93 ± 5.36	73.27 ± 2.55	***0.027****	82.87 ± 3.62	81.80 ± 4.81	0.49
At 80 min	75.60 ± 5.67	71.93 ± 2.96	***0.037****	83.33 ± 3.77	83.64 ± 3.46	0.82
At 95 min	73.10 ± 7.22	70.30 ± 5.29	0.33	79.36 ± 3.30	82.25 ± 6.59	0.16
At 110 min	72.80 ± 2.59	70.20 ± 5.12	0.35	82.00 ± 3.24	76.00 ± 8.00	0.06

*: significant difference between AS and LS groups; #: significant difference between AG and LG groups;

Heart rate showed statistically significant differences between AS and LS groups after spinal injection only at 15m, with more decrease in LS than AS group. There were statistically significant difference between AG and LG groups after induction of general anesthesia at 10m, 15m, 20m, 35m, with more decrease in LG than AG group (Table 5).

Table (5): Heart rate (beats) among studied populations at different points of time (Mean±SD)

Groups / Parameters	AS	LS	P Value	AG	LG	P Value
Basal	85.00 ± 5.15	83.33 ± 6.72	0.80	81.20 ± 8.13	80.40 ± 9.53	0.45
At 1min	83.27 ± 4.83	82.00 ± 5.66	0.89	78.53 ± 7.36	78.93 ± 8.44	0.51
At 5 min	81.07 ± 4.80	79.13 ± 4.87	0.42	71.47 ± 6.38	69.47 ± 7.06	0.28
At 10 min	81.33 ± 6.11	75.13 ± 5.53	0.26	79.27 ± 7.84	76.67 ± 4.03	***0.007#***
At 15 min	78.27 ± 3.51	71.20 ± 6.48	***0.04****	74.20 ± 4.14	78.87 ± 7.48	***0.001#***
At 20 min	76.20 ± 4.75	68.27 ± 7.73	0.72	73.73 ± 5.96	74.60 ± 7.51	***0.002#***
At 35 min	72.87 ± 5.05	67.27 ± 6.52	0.85	74.33 ± 4.53	73.87 ± 8.31	***0.014#***
At 50 min	70.87 ± 5.30	67.80 ± 5.94	0.88	75.27 ± 4.79	74.93 ± 7.48	0.14
At 65 min	70.33 ± 5.41	67.40 ± 5.57	0.67	74.40 ± 6.09	75.20 ± 3.93	0.15
At 80 min	69.13 ± 5.97	66.53 ± 4.91	0.89	75.53 ± 6.65	75.21 ± 5.82	0.20
At 95 min	68.92 ± 5.55	67.00 ± 5.60	0.98	74.50 ± 4.59	74.46 ± 6.37	0.43
At 110 min	70.83 ± 2.48	68.40 ± 6.11	0.54	75.86 ± 3.44	74.57 ± 4.16	0.39

*: significant difference between AS and LS groups; #: significant difference between AG and LG groups;

Statistically significant differences were found between AS and LS groups after spinal injection only at 10m, 15m,20m, 65m, with more decrease in LS than AS group. There was statistically insignificant difference between AG and LG groups after induction of general anaesthesia (Table 6).

Table (6): oxygen saturation among studied populations at different points of time (Mean±SD)

Groups / Parameters	AS	LS	P Value	AG	LG	P Value
Basal	98.13 ± 1.06	98.00 ± 0.85	0.70	98.20 ± 0.94	97.87 ± 0.74	0.29
At 1min	98.67 ± 0.72	98.87 ± 0.83	0.48	98.27 ± 0.88	98.40 ± 0.63	0.63
At 5 min	98.47 ± 0.83	98.80 ± 0.86	0.29	98.27 ± 0.80	98.27 ± 0.80	1.00
At 10 min	99.20 ± 0.56	98.27 ± 0.88	***0.002****	98.40 ± 0.99	97.93 ± 0.80	0.16
At 15 min	99.00 ± 0.65	98.27 ± 0.80	***0.011****	98.20 ± 0.94	97.93 ± 0.46	0.33
At 20 min	98.53 ± 0.92	99.13 ± 0.52	***0.038****	98.27 ± 0.80	97.87 ± 0.83	0.19
At 35 min	98.13 ± 1.06	98.20 ± 0.94	0.85	98.33 ± 0.90	98.07 ± 0.80	0.39
At 50 min	98.40 ± 0.91	98.67 ± 0.82	0.40	98.33 ± 0.82	98.00 ± 0.85	0.28
At 65 min	98.80 ± 0.56	98.33 ± 0.62	***0.039****	98.27 ± 0.88	98.07 ± 0.80	0.52
At 80 min	98.73 ± 0.70	98.53 ± 0.83	0.48	98.27 ± 0.88	98.14 ± 0.77	0.69
At 95 min	99.20 ± 0.42	98.45 ± 0.69	***0.008****	98.21 ± 0.80	98.17 ± 0.83	0.88
At 110 min	98.80 ± 0.45	99.00 ± 0.00	0.37	98.33 ± 1.03	98.00 ± 0.71	0.54

*: significant difference between AS and LS groups;

DISCUSSION

There were statistically significant differences between AG and LG groups with more reduction in blood pressure in LG than AG group especially immediately after induction of general anesthesia and at different times after that, more drop in blood pressure occurred in LG group after induction of anesthesia which was statistically significant. There were In agreement with our results *(Comfere et al., 2005)* studied angiotensin converting enzyme inhibitors in a general surgical population underwent vascular surgery with general anesthesia. The study observes that in the first 30 min after induction there are more cases of moderate hypotension.

Also, in agreement with our results, in another prospective, randomized, double-blind study patients who underwent general anesthesia, on ACEI no differences are registered regarding basal characteristics, a higher number of cases of hypotension and need of vasoactive support is observed after the induction of anesthesia *(Schirmer and Schurmann 2007)*.

Also in agreement with our results *Brabant et al. (1999)* assesses different hypotensive drugs (ACEI and CCBs) which are maintained until anesthesia is induced The study shows that a higher

number of episodes of hypotension which are more intense in ACEi in camparison to CCBs group which none of the patients showed hypotension.

In agreement with our results *Duminda and Scott (2003)* studied the effect Although Effects of extended-release metoprolol succinate in patients undergoing non-cardiac surgery and found CCBs have not been widely reported to cause intraoperative hemodynamic instability, hypotension in patients undergoing non-cardiac surgery.

Also, in agreement with our results *Calloway et al. (2014)* compare postinduction hemodynamics differences among hypertensive patients whom on ACEIs in comparison to whom on CCBs in patients subjected for spinal and general anesthesia, the primary outcomes investigated were absolute decrease in SBPs and MAPs, incidence of intraoperative hypotension associated with ACEIs group more than that happened with CCBs *(James Calloway et al., 2014).*

Schulte et al. (2011) stated the pressure levels are lower in the group who receive AECI, compared with their own basal levels, when he underwent a study on hypertensive patients on ACEIs subjected for general anesthesia

Turan et al. (2012) showed insignificant differences regarding the arterial pressure levels or the number of hypotensive episodes at any point during the surgical procedure among the different groups of patients who receive different antihypertensive drugs and those who do not use them. The authors did observe that in the group of patients who received AECIs, the consumption of phenylephrine is significantly higher.

In disagreement with our results the work made by ***Salvetti et al. (2016)*** a prospective observational study, on patients on ACEIs or not, it was carried out in operations that required general anaesthesia. The hemodynamic follow-up was until150 min in the post anaesthesia care unit. They found no differences between the arterial pressures in both groups.

Oliveira-Paula et al. (2018) suggested that subjects taking ACEI preoperatively are more Susceptible to develop hypotension requiring intervention intra-operatively as compared to patients for whom ACEI are withdrawn immediately before surgery or whom on CCBs. More intense decreases in blood pressure induced by propofol were observed in patients chronically treated with enalapril compared with controls, and the incidence of hypotensive episode in patients receiving ACEI increases with the doses of propofol. ***Rosenman et al. (2008)*** showed that continuing drugs up to the morning of surgery was more likely to lead to hypotension at or following induction of anesthesia with a need for vasopressor to restore the blood pressure to normal levels.

Regarding blood pressure changes (SBP, DBP, MAP), In the present study, there was a statistically significant difference between AS&LS groups as more reduction in LS than AS group.

In agreement with our results ***Calloway et al. (2014)*** studied on Patients who were hypertensive whether taking or not taking any antihypertensive medications and had undergone

orthopedic surgery under spinal ansthesia. The primary outcomes were absolute decrease occurred in SBPs and MAPs, incidence of intraoperative hypotension.

Patients who were hypertensive whether taking or not taking any antihypertensive medications and had undergone elective general & orthopedic surgery during the duration of the study period, stated that CCBs were associated with no hemodynamic instabilityand reduced risk of death and MI Studies have shown that ACE inhibitors and ARB are associated with higher incidence of intraoperative hypotension *(Gustavo et al. B:id 2018).*

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مقارنة عقار ليزينوبريل بعقارأملوديبين في علاج مرض إرتفاع ضغط الدم عند التعرض للتخدير

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خلفية البحث : يعد إرتفاع ضغط الدم الشرياني الجهازي من الامراض الشائعه عند المرضى المتقدمين لإجراء العمليات الجراحية ويمثل تخديرمريض ضغط الدم المرتفع مشكلة كبرى عند طبيب التخدير اثناء العملية الجراحية وبعدها وأيضا من قبل ذلك عند اتخاذ القراربالقيام بالجراحة و عدم التأجيل.

الهدف من البحث: كما تهدف هذه الرسالة إلى التعريف بارتفاع ضغط الدم والأسباب المؤدية إليه . كذلك الإشارة إلى الطريقة الصحيحه للتعامل مع مريض ضغط الدم المرتفع اثناء العمليات المختلفة. وذلك من خلال دراسة معالجة ماقبل العملية و اتخاذ القرار بإجراء الجراحة فى موعدها و عدم تأجيلها ، كذلك المعالجة أثناء العملية الجراحية والطريقة التخديرية المختارة و أيضا المعالجة التخديرية بعد إجراء العملية.

و قد خلص البحث إلى التعرف على المشاكل الناتجة عن إرتفاع ضغط الدم اثناء العمليات الجراحية و التى تؤثر على القلب و المخ وغيرهما من الأعضاء و قد تؤدى إلى الوفاة ، كما تحددت الطريقة المثلى للمعالجة التخديرية لهؤلاء المرضى اثناء العمليات الطارئة و الغير الطارئة . كما تبين اى من الحالات يجب تاجيلها بسبب ارتفاع ضغط الدم.

المرضي و طرق البحث: بعد أخذ موافقه لجنة الأخلاقيات الطبية بجامعة الأزهر ، تم إختيار ٦٠ مريضا من كلا الجنسين ما بين٤٠-٦٠ سنة ذوي الدرجه الثانيه حسب تصنيف الجمعية الأمريكية للتخدير والخاضعين لعلاج مرض إرتفاع ضغط الدم الشرياني بواسطة مجموعتين من الأدوية المعالجة لهذا المرض ، وتم تقسيم المرضى عشوائيا إلى أربع مجموعات متساوية والمسجلين في الجراحة الاختيارية تحت التخدير العام والنصفي: **المجموعة الأولي:** المرضي الذين يعانون من إرتفاع ضغط الدم ويتناولون ليزينوبريل ، ومتعرضين للتخدير الكلي، و**المجموعه الثانية:** المرضي الذين يعانون من إرتفاع ضغط الدم ليزينوبريل ، ومتعرضين للتخديرالنصفي، **والمجموعه الثالثة:** المرضي الذين يعانون من إرتفاع ضغط الدم ويتناولون الأمليوديبين ، ومتعرضين للتخدير الكلي، و**المجموعة الرابعة:** المرضي الذين يعانون من إرتفاع ضغط الدم ويتناولون الأمليوديبين ومتعرضين للتخدير النصفي. وقد استبعد من هذه الدراسة المرضى الغير لائقين لمثل هذه الدراسات كالذين يعانون من إرتفاع ضغط الدم غير المنضبط أو وجود مضاعفات ارتفاع ضغط الدم (تلف العضو المستهدف)، أو وجود أمراض جهازية شديدة مرتبطة بالكبد أوالقلب أوالكلى أوالجهاز التنفسي ،

أو المرضى الذين يتناولون أدوية من أكثر من مجموعه من مجموعات الأدوية المعالجة لإرتفاع ضغط الدم الشرياني، أو الذين تم وقف تناول الأدوية الخافضة للضغط خلال الـ ٦ أشهر الماضية حتى وقت العملية الجراحية.

وتم تخديرالمرضى تخديرا عاما باستخدام الأدوية التالية: الفنتانيل (٢ ميكروغرام / كغ / جرعة) - بروبوفول (٢ مغ / كغ / جرعة) - روكورونيوم (٠,٦ مجم / كجم) - أيزوفلوران (ماك ١,٢). وتم إجراء التخدير الشوكي في وضعية الجلوس فيما بين الفقرتين القطنيتين الثالثة والرابعة باستخدام إبرة بذل قطني مقاس ٢٥، وتم حقن بوبيفكين عالي الكثافه ٠,٥% (٠,٣ مجم/كجم) و ٢٠ ميكروغرام الفنتانيل (٠,٥ مل) داخل الأم الجافية.

وتم متابعه المرضي ومراقبة التغيرات الديناميكية الدموية:

- ضغط الدم الشرياني :(ضغط الدم الشرياني الانقباضي ، ضغط الدم الشرياني الإنبساطي ، وضغط الدم الشرياني المتوسط) .

- معدل ضربات القلب ونسبه تشبع الاكسجين بالدم على النحو التالي:
- ضغط الدم الشرياني القاعدي قبل الجراحة وقراءة معدل النبض. (٠) ثم مباشرة بعد بدء التخدير العام مباشرة. (١) ثم كل ٥ دقائق لمدة ٢٠ دقيقة. ثم كل ١٥ دقيقة حتى نهاية العملية.

النتائج: تبين أن مجموعتي الأملوديبين فعالتين في تخفيف الارتفاع في متوسط معدل النبض وتثبيط الارتفاع في استجابة ضغط الدم الانقباضي لتنظير الحنجرة والتنبيب ، بينما كانت مجموعتي ليزينوبريل (وخاصة المجموعه الثالثة) مصحوبة في أغلب الحالات بحدوث إنخفاض ضغط الدم بعد تحريض التخدير وحدوث إرتفاع ضغط الدم بعد تنظير الحنجرة والتنبيب ، أو غيرها من المحفزات الضارة، وإستجابات مبالغ فيها للضغط ومعدل ضربات القلب للمحفزات الضارة عندما يتم حجب الأدوية قبل التخدير والجراحة.

الإستنتاج: تبين من الدراسة أن عقار أملوديبين أفضل من عقار ليزينوبريل في علاج مرضي ضغط الدم المتعرضين للتخدير، فهوفعال في تخفيف الإرتفاع في متوسط معدل النبض وتثبيط الإرتفاع في إستجابة ضغط الدم الإنقباضي لتنظير الحنجرة والتنبيب.