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ADDITION OF PANCURONIUM AND NITROGLYCERIN TO LIDOCAINE FOR INTRAVENOUS REGIONAL ANESTHESIA IN UPPER EXTREMITY SURGERY: BLOCK CHARACTERISTICS AND POSTOPERATIVE ANALGESIA

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ABSTRACT

Background: Intravenous regional anesthesia (IVRA) provides reliable and rapid analgesia with good muscle relaxation of the extremity distal to the tourniquet, but tourniquet pain and absence of post-operative analgesia are major drawbacks. Nitroglycerine and muscle relaxants are known to potentiate peripheral nerve blocks. **Objective:** Comparing nitroglycerine and pancuronium as adjuvants to IVRA with respect, block characteristics, and post- operative analgesia. **Patient and Methods:** This study was carried out in Al- Azhar University Hospitals for 6 months (from 1/4/2016 to 1/10/2016) on 60 patients of both sexes aged 20-50 years, and belonging to ASA I & II undergoing forearm and hand surgeries. Patients were randomely divided into three equal groups (20 patients at each group) . *Group I received* 40 cc of 3 mg/kg of lidocaine diluted in normal saline (0.9 % NaCl), *Group II recieved* 40 cc of 1.5 mg/kg of lidocaine diluted in normal saline (0.9% NaCl) with 200 µg nitroglycerine, and *Group III received* 40 cc of 1.5 mg/kg of lidocaine diluted in normal saline (0.9 % NaCl with 200 µg nitroglycerin and 0.5 mg pancuronium. **Results:** Group I has the slowest sensory and motor onset time, but the shortest sensory and motor recovery time. There was no significant difference between Group II and III as regarding sensory onset and recovery times, but Group III has shoter motor onset time and more prolonged motor recovery time than Group II. As regard postoperative analgesic requirements, Group II and III needed less analgesic doses than Group I, but there was no significant difference between Group II and III. **Conclusion:** Addition of 0.5 mg pancuronium and 200 µg nitroglycerin as adjuvant to lidocaine for intravenous regional anesthesia reduced the dose of lidocaine used for IVRA, shortened the sensory and motor block onset times, prolonged the sensory and motor block recovery times, and reduced the postoperative analgesic requirement and improved the quality of intravenous regional anesthesia with no sideeffects.

Keywords: Lidocaine, nitroglycerine, pancuronium, intravenous regional anesthesia.

INTRODUCTION

Intravenous regional anesthesia (IVRA) or Bier's block is an ideal technique for outpatient undergoing extremity surgery lasting less than one hour. ***(Sardesai et al., 2015)*** It is easy to be administered, lower cost compared with general anesthesia, no need for deep sedation and can be used for emergency operations for patients with full stomach. IVRA shortens hospital

length of stay when compared with general anesthesia ***(Celik et al., 2016)***.

IVRA has also disadvantages such as tourniquet pain, insufficient postoperative analgesia, poor muscle relaxation, local anesthesia toxicity ***(Honarmand et al., 2015)***.

Lidocaine is amino amide local anaesthetic. The main action of lidocaine is via sodium channel inactivation. Also it inactivate potassium, calcium channels and it has the ability to block NMDA receptors. ***(Van der Wal et al., 2015)*** Because of safety and effectiveness, it has become the most common local anesthesia to be used. It has intermediate duration of action and its cardiotoxicity is one ninth bupivacaine. ***(Maruthingal et al., 2015)*** The ideal solution for IVRA should have rapid onset to reduce the dose of LA, prolong post deflation analgesia, and decrease tourniquet pain. ***(Batra et al., 2008)*** To achieve this, other drugs including narcotics, non-steroidal anti-inflammatory drugs (NSAIDs), clonidine, nitroglycerin (TNG), dexmedetomidine, magnesium, and neostigmine were used in combination with lidocaine in different studies ***(Abbasivash et al., 2009)***.

Nitroglycerin has been used as an adjuvant with many anesthetic drugs to induce fast effect in controlling acute and chronic pains. ***(Hassani et al., 2015)*** It was proved that nitroglycerine (TNG), nitric oxide generator, helps in distribution of local anesthetic agents to neuron trunks by vasodilatation and also it has been demonstrated that, when nitroglycerine is used with other drugs, analgesic effect is increased ***(Cakmak et al., 2014)***.

Various neuromuscular blocking agents have been used with IVRA to improve the operating conditions and reduce the local anesthetic dose and possible systemic toxicity. Administration of neuromuscular blocking drugs including pancuronium (0.5 mg) with local anesthetics in upper limb IVRA improves surgical conditions in Adults and no reported complications from using adjuvant neuromuscular blocking drugs in IVRA ***(Dominic and Barry , 2007)*** .

The present work aimed to compare nitroglycerine and pancuronium as adjuvant to IVRA.

PATIENTS AND METHODS

The study was designed as a prospective, double-blinded clinical trial. This study was carried out in Al-Azhar University Hospitals for 6 months (from 1/4/2016 to 1/10/2016) on 60 patients of both sexes aged 20 -50 years belonging to ASA I & II undergoing forearm and hand surgeries. After obtaining approval from ethical committee, a written consents were obtained from the patients after they were informed about the procedure.

Exclusion criteria included patient refusal, liver disease, Reynauld's disease, sickle cell disease, crush injuries and hand infection. The 60 Patients were be randomely divided into three equal groups (computer generated with sealed envelope technique) : *Group I recieved* 40 cc of 3mg/kg of lidocaine diluted in normal saline (0.9 % NaCl), *Group II recieved* 40

cc of 1.5mg/kg of lidocaine diluted in normal saline (0.9% NaCl) with 200 µg Nitroglycerine, and *Group III recieved* 40 cc of 1.5mg/kg of lidocaine diluted in normal saline (0.9 % NaCl) with 200 µg Nitroglycerin and 0.5 mg pancuronium.

Close monitoring of the patient should be done. A 22 Gauge intravenous cannula was inserted in the dorsum of operative hand (as distal as possible) for injection of the study drugs, another 20 Gauge intravenous cannula was inserted in the controlateral hand for crystalloid infusion. A double pneumatic tourniquet was placed on the upper arm on operative side and then it was exanguated by 2 min. elevation and wrapping with an Esmarch bandage. The proximal tourniquet was then inflated to 100 mmHg above the systolic blood pressure or to a minimum of 250 mmHg, then selected local anesthetic solution was injected. After adequate block, distal tourniquet was inflated and the proximal tourniquet was deflated.

Sensory block was assessed every 1 min. by ice cube, while motor block by modified Bromage scale. Sensory and motor block recovery times were assessed. Postoperative pain evaluation using NRS was assessed every 1 hr or need for analgesics. If NRS > 3, patient received 10 mg/kg of paracetamol by IV infusion as a first dose . After 60 minutes, if he still in pain and NRS was >3, the patient received a second dose of 5 mg/kg. Patient's and surgeon's satisfaction score were recorded. Any local or systemic complications were recorded.

Statistical analysis: Data were analyzed using IBM SPSS software package version 20.0 ***(Aujla et al., 2009 and Elmetwaly et al., 2010)*** . Comparison between groups regarding categorical variables was tested using Chi-square test. When more than 20% of the cells have expected count less than 5, correction for chi-square was conducted using Fisher's Exact test or Monte Carlo correction. The distributions of quantitative variables were tested for normality using Kolmogorov-Smirnov test, Shapiro-Wilk test and D'Agstino test. For normally distributed data, comparison between more than two population were analyzed F-test (ANOVA) to be used and Post Hoc test (Tukey). For abnormally distributed data, Kruskal Wallis test was used to compare between different groups and pair wise comparison was assessed using Mann-Whitney test. p value > 0.05 was considered significant .

RESULTS

- There was no statistically significant difference between the three groups as regards age, weight, sex, ASA physical status, duration of surgery and percentage of types of surgeries (Table 1).

Table (1): Demographic data in the studied groups.

Parameters \ Groups			Group I (n=20)	Group II (n=20)	Group III (n=20)	Test of sig.	P value
Age (ys)	**Range**		19-49	19-49	19-49	F = 0.359	0.700
	Mean ±SD		29.80 ±8.62	29.65 ±9.20	27.70 ±8.39		
Sex	**Male**	**No.**	15	16	15	χ^2 = 0.275	1.000
		%	75	80	75		
	Female	**No.**	5	4	5		
		%	25	20	25		
Weight (kg)	**Range**		60 -95	65- 98	69 -95	F = 0.547	0.581
	Mean ±SD		78.10 ±9.95	79.35 ±8.35	81.0 ±7.95		
ASA	**I**	**No.**	18	18	18	χ^2 = 0.223	1.000
		%	90	90	90		
	II	**No.**	2	2	2		
		%	10	10	10		
Duration of surgery (min)	**Range**		30 -55	38- 57	34 -55	**F = 0.613**	**0.545**
	Mean ±SD		45.25 ±7.08	46.50 ±5.57	44.40 ±5.31		

χ^2: Chi square test Sig. bet. groups was done using Chi square test or Fisher Exact
F, p: F and p values for ANOVA test, Sig. bet. grps was done using Post Hoc Test (LSD)

- There was a statistically significant decrease in sensory block onset time of Gr II (3.65 ± 0.99 min.) and Gr III (4.0 ± 0.97 min.) compared with Gr I (6.3 ± 1.53 min.), but there was no significant difference between Gr II and Gr III (Table 2).

Table (2): Comparison between the three studied groups according to sensory block onset times.

Groups / Sensory Block onset Times (min)	Sensory Block Onset Times (min.)		
	Group I	**Group II**	**Group III**
Min.(min)	4.0	2.0	2.0
Max.(min)	9.0	6.0	6.0
Mean	6.30	3.65	4.0
±SD.	1.53	0.99	0.97
Median	6.0	4.0	4.0
F	29.259*		
P	<0.001*		
p_1	<0.001*		
p_2	<0.001*		
p_3	0.356		

F, P: F and P values for ANOVA test, Sig. bet. grps was done using Post Hoc Test (LSD).
p_1: p value for comparing between Group I and Group II.
p_2: p value for comparing between Group I and Group III.
p_3: p value for comparing between Group II and Group III.
*: Statistically significant at $p \leq 0.05$.

- There was a statistically significant differences in motor block onset time between the three groups. The shortest time was in Gr III (7.80 ± 1.36 min.) followed by Gr II (10.65 ± 2.01 min.), while the longest time was Gr I (13.35 ± 1.04 min. - Table 3).

Table (3): Comparison between the three studied groups according to motor block onset times.

Groups / Motor Block Onset Times (min.)	Motor Block Onset Times (min.)		
	Group I	**Group II**	**Group III**
Min.(min)	12.0	7.0	5.0
Max.(min)	15.0	14.0	10.0
Mean	13.35	10.65	7.80
±SD.	1.04	2.01	1.36
F	66.371*		
P	<0.001*		
p1	<0.001*		
p2	<0.001*		
p3	<0.001*		

F, P: F and P values for ANOVA test, Sig. bet. grps was done using Post Hoc Test (LSD).
p_1: p value for comparing between Group I and Group II.
p_2: p value for comparing between Group I and Group III.
p_3: p value for comparing between Group II and Group III.
*: Statistically significant at $p \leq 0.05$

- There was a statistically significant increase in motor block intensity i.e. lesser Modified Bromage Scale in Gr II (1.85 ± 0.37 min.) and Gr III (2.0 ± 0.0 min.) compared with Gr I (1.50 ± 0.51 min.), but there was no significant difference between Gr II and Gr III (Table 4).

Table (4): Intensity of motor block according to ModifiedBromage Scale in studied groups**.**

Groups / Modified Bromage Scale	Modified Bromage Scale		
	Group I	**Group II**	**Group III**
Min.	1.0	1.0	2.0
Max.	2.0	2.0	2.0
Mean	1.50	1.85	2.0
±SD.	0.51	0.37	0.0
Median	1.50	2.0	2.0
KWχ^2	15.257*		
P	<0.001*		
p_1	0.020*		
p_2	<0.001*		
p_3	0.075		

KWχ_2: Chi square for Kruskal Wallis test Sig. bet. grps was done using Mann Whitney test
p_1: p value for comparing between Group I and Group II.
p_2: p value for comparing between Group I and Group III.
p_3: p value for comparing between Group II and Group III.
*: Statistically significant at $p \leq 0.05$

- There was a statistically significant increase in sensory block recovery time of Gr II (10.45 ± 1.85 min.) and III (11.0 ± 1.89 min.) compared with Gr I (6.85 ± 1.46 min.) but there was no significant difference between Gr II and Gr III (p_3 0.323 - Table 5).

Table (5): Comparison between the three studied groups according to sensory block recovery times**.**

Groups / Sensory Block Recovery Times (min.)	Sensory Block Recovery Times (min.)		
	Group I	**Group II**	**Group III**
Min.(min)	5.0	4.0	8.0
Max.(min)	9.0	12.0	15.0
Mean	6.85	10.45	11.0
±SD.	1.46	1.85	1.89
F	33.384*		
P	<0.001*		
p_1	<0.001*		
p_2	<0.001*		
p_3	0.323		

F, P: F and P values for ANOVA test, Sig. bet. grps was done using Post Hoc Test (LSD).
p_1: p value for comparing between Group I and Group II.
p_2: p value for comparing between Group I and Group III.
p_3: p value for comparing between Group II and Group III.
*: Statistically significant at $p \leq 0.05$

- There was a statistically significant difference between the three groups in motor block recovery time. The longest recovery time was in Gr III (21.65 ± 2.03 min.) followed by Gr II (13.30 ± 1.81 min.), while the shortest was in Gr I (11.60 ± 1.73 min. - Table 6).

Table (6): Comparison between the three studied groups according to motor block recovery times

Groups / Motor Block Recovery Times (min.)	Motor Block Recovery Times (min.)		
	Group I	**Group II**	**Group III**
Min.(min)	9.0	10.0	18.0
Max.(min)	14.0	16.0	25.0
Mean	11.60	13.30	21.65
±SD.	1.73	1.81	2.03
F	166.980*		
P	<0.001*		
p_1	0.005*		
p2	<0.001*		
p3	<0.001*		

F, p: F and p values for ANOVA test, Sig. bet. grps was done using Post Hoc Test (LSD).
p_1: p value for comparing between Group I and Group II.
p_2: p value for comparing between Group I and Group III.
p_3: p value for comparing between Group II and Group III.
*: Statistically significant at $p \leq 0.05$

- There was a significant increase of NRS for postoperative pain at 1 hr and 2 hour in Gp I than Gr II or Gr III, and increase of NRS for postoperative pain after 3 hours in Gr II and Gr III, no significant difference between study groups after 4 hours (Table 7).

Table (7): Changes in postoperative NRS in studied groups.

Groups / Postoperative NRS	Postoperative NRS			
	1 hr	**2 hrs**	**3 hrs**	**4 hrs**
Group I				
Min.	1.0	2.0	1.0	1.0
Max.	4.0	4.0	3.0	4.0
Mean	2.80	3.10	2.10	2.15
±SD.	1.06	1.02	0.45	0.67
Median	3.0	4.0	2.0	2.0
Group II				
Min.	0.0	1.0	1.0	0.0
Max.	2.0	3.0	4.0	4.0
Mean	1.30	1.90	3.10	2.55
±SD.	0.80	0.45	1.07	1.47
Median	1.50	2.0	4.0	2.0
Group III				
Min.	0.0	2.0	0.0	0.0
Max.	2.0	3.0	4.0	4.0
Mean	1.0	2.10	3.20	2.65
±SD.	0.92	0.31	1.20	1.27
Median	1.0	2.0	4.0	2.0
$KW\chi^2$	23.533*	20.131*	14.681*	1.833
P	<0.001*	<0.001*	0.001*	0.400
p_1	<0.001*	<0.001*	0.002*	0.369
p_2	<0.001*	0.001*	<0.001*	0.139
p_3	0.296	0.107	0.682	0.840

$KW\chi^2$: Chi square for Kruskal Wallis test Sig. bet. grps was done using Mann Whitney test.
p_1: p value for comparing between Group I and Group II.
p_2: p value for comparing between Group I and Group III.
p_3: p value for comparing between Group II and Group III.
*: Statistically significant at $p \leq 0.05$

- There was a significant decrease of postoperative analgesic requirements in Gr II (10.50 ± 1.54 mg/kg) and Gr III (10.75 ± 1.83 mg/kg) compared with Gr I (13.25 ± 2.45 mg/kg) but there was no significant difference between Gr II and Gr III (p3 0.691 - Table 8).

Table (8): Comparison between the three studied groups according to P.O analgesic requirements (paracetamol iv infusion 10-15mg/kg).

Groups / Paracetamol IV infusion (mg/kg)	P.O Analgesic Requirements paracetamol (mg/kg)		
	Group I	**Group II**	**Group III**
Min.(mg/kg)	10.0	10.0	10.0
Max.(mg/kg)	15.0	15.0	15.0
Mean	13.25	10.50	10.75
±SD.	2.45	1.54	1.83
F	11.848*		
P	<0.001*		
p_1	<0.001*		
p_2	<0.001*		
p_3	0.691		

F, p: F and p values for ANOVA test, Sig. bet. grps was done using Post Hoc Test (LSD).
p_1: p value for comparing between Group I and Group II.
p_2: p value for comparing between Group I and Group III.
p_3: p value for comparing between Group II and Group III.
*: Statistically significant at $p \leq 0.05$

DISCUSSION

Intravenous regional anesthesia (IVRA) is a technically simple, reliable and cost-effective method of regional anesthesia for short operative procedures of the extremities ***(Sethi and Wason, 2010)***. IVRA is a suitable technique for short elective surgical procedures performed on the distal arm , but it can also be used in the case of an emergency procedures ***(Ali et al., 2016)***. Disadvantages of this block include tourniquet pain , poor muscle relaxation, short duration of block and absence of post-operative analgesia **(Esha et al., 2016).**

The ideal IVRA solution should have the following features: rapid onset, reduced dose of LA, reduced tourniquet pain, and prolonged post deflation analgesia ***(Nasr and Waly, 2011)***. Different additives such as opioids, non-steroidal anti-inflammatory drugs (NSAIDs), dexmedetomidine, and muscle relaxants have been combined with LAs to improve block quality, prolong post-operative analgesia and decrease tourniquet pain ***(Sethi and Wason, 2010)***. Intravenous regional anesthesia acts by diffusion of local anesthetic into the small veins surrounding the nerves, leading to a centrifugal conduction block in the nerves involved ***(Eapen et al., 2015)***.

Nitroglycerine helps in distribution of local anesthetic agents to neuron trunks by vasodilatation ***(*Biricik et al., *2014)***. NTG exerts its analgesic effect as it is metabolized to nitric oxide (NO) in the cell. NO causes an increase in the intracellular concentration of cyclic guanosine monophosphate, which produces pain modulation in the central and peripheral nervous systems. NO generators also induce anti-inflammatory

and analgesic effect ***(Asadi and Mehri, 2013)***.

Various neuromuscular blocking agents have been used with IVRA to improve the operating conditions and reduce the local anesthetic dose and possible systemic toxicity. Administration of neuromuscular blocking drugs including pancuronium (0.5 mg) with local anesthetics in upper limb IVRA improves surgical conditions in Adults and no reported complications from using adjuvant neuromuscular blocking drugs in IVRA ***(Aujla et al., 2009)***. Addition of muscle relaxants to lidocaine for IVRA has shown to shorten the motor block onset time, prolong the motor block recovery time and improve the muscle relaxation and operative conditions ***(Esmaoglu et al., 2006)***. Muscle relaxants act at the level of the muscle spindle and reduce the central input from these structures resulting in loss of muscle tone and spasm ***(Aujla et al., 2009)***.

The aim of the present study is to reduce the dose of lidocaine to decrease toxicity potentials and to improve postoperative analgesia by the use of pancuronium and nitroglycerin with lidocaine for intravenous regional anesthesia for upper extremity surgery.

As regard onset time of sensory block, there was significant decrease in sensory block onset time in Gr II (3.65 ± 0.99) and Gr III (4.0 ± 0.97) when compared with Gr I (6.30 ± 1.53). Also, the present study revealed that sensory block recovery time was significantly prolonged in Gr II (10.45 ± 1.85) and Gr III (11.0 ± 1.89) when compared with Gr I (6.85 ± 1.46).

Asadi and Mehri (2013) studied the addition of 200 ?g nitroglycerin to lidocaine for IVRA in patients scheduled for hand and forearm surgery and they found that sensory block onset time was shorter in nitroglycerin group when compared to lidocaine group.

Moreover, ***Abbasivash et al. (2009)*** studied Forty-six patients scheduled for closed reduction of forearm fractures. The study group received 200 ?g NTG mixed with 0.5% lidocaine. They found that adding nitroglycerin to lidocaine in IVRA leads to shorter sensory block onset time. The recovery time of sensory block was prolonged.

Also, ***Sen et al.(2006), Asadi and Mehri (2013) and Cakmak et al. (2014)*** studied the effect of adding 200 ?g nitoglycerin to 3 mg/kg lidocaine for IVRA on patients undergoing hand surgery in two groups and they found that the addition of nitroglycerin to lidocaine in IVRA shortened the onset time of sensory block with prolonged sensory block recovery time.

In addition, ***Elmetwaly et al. (2010)*** studied the analgesic effect of 200 ?g nitroglycerin when added to 3 mg/kg 0.5% lidocaine (maximum 200 mg) for IVRA on patients scheduled for elective forearm and hand surgery and agreed the present study results by reporting shorter sensory block onset time and delay in sensory block recovery time after tourniquet release in the nitroglycerin group.

Sen et al. (2006), Elmetwaly et al. (2010), Asadi and Mehri (2013) and Cakmak et al. (2014) studied the effect of adding 200 ?g nitoglycerin to 0.5% lidocaine for IVRA on patients undergoing hand surgery and they found shortened the onset time of motor block

with prolonged recovery time which was in agreement with the present study.

Moreover, ***Abbasivash et al. (2009)*** found that adding 200 ?g nitroglycerin to 0.5% lidocaine in IVRA leads to shorter motor block onset time. The recovery time of motor block was prolonged which was in agreement with the present study results.

In the present study we used 1.5 mg/kg lidocaine and it gave the same results of all previous studies which used 3 mg/kg lidocaine, the present study show that the use of nitroglycerine shortens the sensory and motor block onset times and delays the sensory and motor block recovery times.

Regarding pancuronium, ***Flamer and Peng (2011)*** evaluated thirty one studies with data collected on 1523 subjects and use of muscle relaxants (pancuronium, atracurium, mivacurium and cisatracurium) that revealed that the use of muscle relaxants as adjuvant in IVRA enhances motor block and shortens its onset time with delay of its recovery time. In addition to making the surgery easier, addition of muscle relaxant as an adjuvant in IVRA reduces the dose of LA to a nontoxic range.

Aujla et al. (2009) evaluated the effect of lignocaine alone versus mixture of lignocaine, pancuronium for intravenous regional anesthesia on 100 patients divided into two equal groups of 50 each scheduled for elective upper limb surgery, they revealed that the addition of muscle relaxant (0.5 mg pancuronium) to IVRA anesthetic solution improved the muscle relaxation and operative conditions.

The present study show that the use of pancuronium shortens the motor block onset times and delays motor block recovery time and it gave the same effect of all previous studies although we use 1.5 mg/kg of lidocaine.

Sen et al. (2006) and Honarmand et al. (2011) studied the effects of adding 200 ?g nitoglycerin to 3 mg/kg lidocaine 0.5 % for IVRA and they found that postoperative analgesic requirements were significantly smaller in NTG groups ($P < 0.0001$).

In addition, ***Abbasivash et al. (2009) , Elmetwaly et al. (2010) and Cakmak et al. (2014)*** studied the effects of adding 200 ?g nitroglycerin to 3 mg/kg lidocaine 0.5 % for IVRA on patients undergoing hand surgery and they found that postoperative analgesic requirement was lower for the first 4 hours in the nitroglycerine group. There was significant difference in paracetamol requirement between the groups L (lidocaine) and LL-N (lidocaine and nitroglycerine): $P = 0.001$.

In the present study, postoperative analgesic requirement (paracetamol iv infusion) showed a significant decrease in Gr II (10. 50 ± 1.54) and Gr III (10.75 ± 1.83) compared with Gr I (13.25 ± 2.45).

In the present study, neither patients' satisfaction about the operation nor surgeons' opinion of the operative conditions showed significant difference between the three groups.

No adverse effects or complications were reported in this study. No evidence of central nervous system or cardiac complications were seen after local anesthetic administration, before and during surgery and after release of the tourniquet. This could be due to, the small

dose of lidocaine (1.5 mg/kg), pancuronium (0.5 mg) and nitroglycerin (200 ?g/kg), deflation of tourniquet 60 minutes after inflation and by the cyclic deflation technique.

Abbasivash et al. (2009) found that there were no side effects from using lidocaine 0.5% with 200 ?g nitroglycerin for IVRA.

CONCLUSIONS

Addition of pancuronium and nitroglycerin improve the quality of intravenous regional anesthesia with no side effects, shortens the sensory and motor block onset times, prolongs the sensory and motor block recovery times, and reduce the postoperative analgesic requirement with satisfaction for patient and surgeon.

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إستخدام البانكيوريوم والنيتروجليسرين مع الليدوكيين فى التخدير الموضعي الوريدي عند البالغين الخاضعين لجراحات الطرف العلوي للجسم

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خلفية البحث: التخدير الناحي الوريدي تقنية بسيطة و فعالة من حيث التكلفة و الذى يستخدم لإجراء العمليات القصيرة في الأطراف. و هناك بعض القيود المرتبطة بالتخدير الناحي الوريدي و التي تشمل سمّية المخدر الموضعي، و تأخر العمل، و سوء استرخاء العضلات، و آلام العاصبة، و محدودية التسكين للألم بعد العملية الجراحية . و كي يكون محلول التخدير الناحي الوريدي مثاليا، فيجب أن يشمل المميزات الآتية: سرعة التخدير، وأقل كمية ممكنة من المخدر الموضعي، وأقل ألم للعاصبة وطول مدة تسكين الألم بعد العملية الجراحية. و قد إستخدمت الإضافات المختلفة مع المخدر الموضعي لتحسين جودة التخدير، والحد من آلام العاصبة، وإطالة مدة تسكين الألم بعد تفريغ العاصبة من الهواء كالمخدرات،والعقاقير غير الستيرويدية المضادة للالتهاب، ومرخيات العضلات، والنيوستيجمين.

الهدف من البحث: مقارنة وقت بدء ووقت إنتهاء التخدير، و مقدار الألم ، و المسكنات بعد الجراحة عند إضافة النيتروجليسرين أو عقار البانكرونيم بالوريد إلى عقار الليدوكايين في التخدير الناحي الوريدي لجراحة الطرف العلوي.

المرضى و طرق البحث:هذا البحث تم تنفيذه فى مستشفيات جامعة الأزهر لمدة ٦ أشهر فى الفترة من ١-٤-٢٠١٦ حتى ١-١٠-٢٠١٦ على ٦٠ مريض من عمر ٢٠ حتى ٥٠ سنة من الجنسيين خضعوا لعمليات إختيارية في اليد أو الساعد ، و ذلك بعد الحصول على موافقة لجنة الجودة وأخلاقيات البحث العلمي و موافقة خطية من المرضى .

وقد تم تقسيم المرضى إلى ثلاث مجموعات عشوائية (بنظام الأظرف المغلقة) متساوية العدد:

- **المجموعة الأولى** : تم إستخدام ٤٠سم ٣من الليدوكايين بجرعة ٣ مجم/كجم (المخفف في محلول ملحي طبيعي) لإعطاء التخدير الناحي الوريدي .

- **المجموعة الثانية** : تم إستخدام ٤٠سم ٣من الليدوكايين بجرعة ١،٥ مجم/كجم مضافا إليه ٢٠٠ ميكروجرام نيتروجليسرين لإعطاء التخدير الناحي الوريدي .

● **المجموعة الثالثة** : تم إستخدام ٤٠سم ٣من الليدوكايين بجرعة ١،٥ مجم⁄كجم مضافا إليه ٠،٥ مجم بانكرونيم و ٢٠٠ ميكروجرام نيتروجليسرين لإعطاء التخدير الناحي الوريدي .

وقد شملت هذه الدراسة تقييموقت بدء وإنتهاء التخدير الحسي و الحركي ، و جرعة المسكنات بعد العملية الجراحية ، و مدى إرتياح المريض و الجراح للعملية الجراحية والأعراض الجانبية أو المضاعفات أثناء أو بعد العملية الجراحية.

النتائج: كان وقت بدء التخديرالحسي والحركي في مجموعة الليدوكاييين بطيئا ، ووقت نهايتهما سريعا، بالإضافة إلى إستهلاك كمية أكبر من المسكنات بعد العملية الجراحية. أما فى مجموعة النيتروجليسرين ، فقدبدأ التخدير الحسي في وقت أقصر ، و إنتهى في وقت أطول ، مع إستهلاك وقت أطول لبدء التخدير الحركي و زواله في وقت قصير، بالإضافة إلى إستهلاك كمية قليلة من المسكنات وعدد أقل من المرضى الذين إشتكوا من الألم بعد العملية الجراحية. أما المجموعة الأخيرة و هي مجموعة البانكرونيم و النيتروجليسرين فقد كانت مثل مجموعة النيتروجليسرين ، و باستثناء التخدير الحركي فقد كان وقت البداية أسرع و الزوال في مدة أطول ، و لم تحدث أي مضاعفات في أي مجموعة مما سبق.

الاستنتاج : إضافة البانكرونيم والنيتروجليسرين إلى الليدوكايين في التخدير الناحي الوريدي قلل الجرعة المطلوبة من الليدوكايين للتخدير، وقصر مدة بدء التخدير الحسي والحركي، وجعل نهايتهما في مدة أطول، وأقل شكوى من الألم و أقل إحتياجاً للمسكنات بعد العملية الجراحية، وأفضل جودة للتخدير دون حدوث أى مضاعفات للمرضى .