

DEXTRAN INSTEAD OF ADRENALINE TO PROLONG THE DURATION OF ACTION OF THE LOCAL ANESTHETIC IN HIGH RISK PATIENTS

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SUMMARY

This study was designed to investigate the efficacy of 40000MW dextran instead of adrenalin in prolongation of the duration of action of local anesthesia in high risk patients. Surgery was performed under local anesthesia ,lignocaine 2%with either dextran 40000 MW or adrenaline ,sciatic nerve and three in one block. The results showed no significant variations between the duration of action when the lignocaine 2% used with dextran or adrenaline. Accordingly, dextran is a good alternative for adrenaline in prolongation of local anesthesia in high risk patients.

INTRODUCTION

The lower limb is innervated by four branches of the lumbo-sacral plexus: femoral (L2-L4), obturator, (L1-L3) femoral coetaneous, (L1-L3) and sciatic nerves (L4-S3). Therefore, surgical operation in the lower limbs required general anesthesia, neuron axial (spinal, epidural, and caudal) anesthesia or block all these nerves were also used for surgical interference in the lower limbs⁽¹⁾.The most common emergency operation in diabetes mellitus patients are acute appendicitis ,incision and drainage procedures and lower limbs amputation due to gangrene, in this situation its useful to evaluate the patient metabolic status (blood glucose concentration ,electrolyte ,PH and urine ketons), if DKA is present ,surgery can be delayed while standard treatment of this metabolic emergency is instituted with infusion of fluid ,insulin and potassium⁽²⁾.

Infection, sepsis is a major cause of perioperative morbidity in D.M., so all except life saving emergency surgery in poorly controlled D.M. should be delayed until hyperglycemia and acidosis are controlled⁽³⁾, furthermore

general sepsis is contraindication for central neural blocks, as infection may occur in an extradural space⁽⁴⁾.

Patient with coronary insufficiency, hypertension and high risk patients such as patient with recently experienced myocardial infarction are ideal candidate for regional anesthesia, . However in such patients, major abdominal surgery under intercostal nerves block was preferred⁽⁵⁾.

Reduction of surgical stress, elimination of painful afferent stimuli from the operative site, plus the blocked of efferent sympathetic nerves to endocrine glands, eliminates or greatly reduces the metabolic and endocrine changes seen after surgical operations⁽⁶⁾. Regional anesthesia in the elderly patients decrease post operative mental confusion and allows immediate recognition of angina, transient ischemic attacks and mental changes and very important advantage of regional anesthesia is decreasing of the neuro-endocrine stress response and post operative negative nitrogen balance with less hyperglycemia, because of the reduced catecholamine release⁽⁷⁾.

Adrenalin added to local anesthetics to prolong the effect of local anesthetics .

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Dextran Instead of Adrenaline to Prolong The Duration of Action of The Local Anesthetic in High Risk Patients

Local anesthetics solution contain adrenaline is contraindication in hypertension, ischemic heart disease and peripheral vascular disease^(1,2,4-9). Other drugs used to prolong the duration of local anesthetic like phyloperasine are not available in the Iraq at that time and till now. This study was designed to explore the influence of Dextran on the prolongation of Lignocaine effect in very high risk patients in comparison to adrenaline.

PATIENTS & METHODS

Emergency mid-thigh surgery and amputations were done under nerve blocks for nineteen elderly patients (65–80 years) divided into two groups:

1. Group one included eight male-patients (whom needed emergency operation in the thigh and had no contraindication to adrenaline). Combined sciatic nerve and three in one blocks were done for these patients because of the presence of sever pulmonary diseases or refusal to have general anesthesia. Fifteen ml of a solution composed of 11 ml lignocaine 2% in adrenaline 1/200000 with 4 ml of distal water, was used to block the sciatic nerve and 25 ml of solution composed of 18 ml of 2% lignocaine in adrenaline 1/200000 + 7 ml distal water, was administered to do three in one block . Mild sedation with droperidol 2.5 mg and fentanil 50 microgram were given for all patients .

2. Group two included(11) D.M.. patients, 2 of them were females; all of them had hypertension and smokers, and they have other concomitant diseases and as follow.

a. History of cerebro-vascular accident (C.V.A.): 4 patients (one female and 3 males)

b. Myocardial Infarction (M.I.): 3 males (2 of them less than 3 months)

c. Chronic obstructive pulmonary disease (COPD): 7 patients (2 females and 5 males)

d. Two males with heart failure

These patients were having sepsis and extensive gangrene they refused the surgical intervention at the beginning, but as they became toxic, gangrene seeded up, and sepsis became sever, with pressure of their families, they accepted to undergo the operation. But at that stage, they became not fit for many anesthetic procedures. Investigations were done for the patients but, at that time(second Gulf War and after months), in our hospital and Iraq important investigations were not available like (blood pH and serum potassium and bicarbonate levels).

Blood sugar was more than 300 mg/dl in spite of the high insulin doses regularly given and the careful intravenous fluid (normal saline) replacement.

These patients were not fit for general anesthesia from our anesthetic point of view, so decision to do local anesthesia with peripheral nerve blocks was taken. Combined sciatic nerve and three in one blocks were done for these patients with lignocaine and dextran 40000 M.W. to decrease absorption so decrease the local anesthesia toxicity and to prolong the anesthesia duration to complete the operations, as adrenalin is contraindicated in these patients.

1. Sciatic nerve with 15 ml of solution composed of (11 ml Lignocaine 2% + 2.5 ml dextran 40000 MW +1.5 ml distal water).

2. Three in one block (femoral, obturator and lateral coetaneous nerve of the thigh) with 25 ml of solution composed of (18 ml of 2% Lidocain + 5 ml Dextran 40000 + 2 ml distal water).

The technique was performed to both groups as follows:

1. We blocked sciatic nerve through posterior approach (when the patient is in lateral dequibitus position, knee flexed 90 degrees, hip slightly flexed, a line is traced between the prominence of the greater trochanter and posterior superior iliac spine, from the midpoint of this line a perpendicular line is drawn caudally 4 cm long, and at its end a 22-gauge 10 cm spinal needle is

inserted at right angle to the skin plane until it reaches the ischial spine, 6-7.5 cm from skin surface we draw the needle for one cm and aspirate, where no blood we injects 15 ml of solution⁽⁴⁻⁷⁾. Head up tilt of the bed 30 degree (for those patients with heart failure and COPD) was done.

2. After that three in one block was done for the other three nerves as follow:

The patient is in supine position; a needle is inserted just below the inguinal ligament 1-1.5 cm lateral to the femoral artery. The needle is directed cefalad at about 60 degree from the skin and advanced slowly until give away is sensed as deep as 3 cm advanced more slightly and aspirate were no blood we inject 25 ml of solution⁽⁴⁻⁸⁾.

Head up tilt of the bed 30 degree (for those patients with heart failure and COPD) Oxygen given by mask and monitoring with ECG, pulse oxymeter and sings and symptoms of local anesthetics toxicity.

Operation started 3-5 min later after examination for effectiveness of block.

Three patients became not comfortable in the second group and given medazolam one mg I.V. Time was recorded from the start of injection in three in one block till the patients started feel pain in both groups. Good relaxation, analgesia and surgical condition without any sings or symptoms of toxicity in spite of the large dose given and there was no complication in both groups. After the operation, all patients admitted to I.C.U. where monitored. One female of the second group developed rapid A.F. 5 hours later and treated medically.

RESULTS

Table (1) shows sex distribution of patients in both (Dextran-Lignocain and Adrenalin- Lignocain) groups. There was on great variation in the percentage in male and females between two groups .Table (2) compares age distribution of patients in the both groups. It was

appeared that the majority of the patients were in the 65-70years age group. Statistical analysis showed that there was no significant variations between groups in the demographic parameter. Table (3) shows the differences in the duration of nerve block induced by the two (Dextran-Lignocain and Adrenalin-Lignocain) combinations. It was noted that the differences were statistically not significant. From tables (1) and (2), it was concluded that the patients of both groups were belong to the same population. This would minimize the variations related to sex and age.

DISCUSSION

First of all the sample size not large, as like this operation mainly done under general anesthesia and only small number of patients to be done by local anesthesia where we use adrenaline to prolong the effect of lignocain and to decrease the systemic effect.

There have been many attempts to prolong the duration of local anesthesia by mixing the local anesthetic with low and high molecular weight dextran. The previous results were controversial some of these find no effect for the low molecular weight but very large molecular weight dextran may be effective especially in combination with adrenalin. Macromolecules may be formed between dextran and local anesthetic so the later is held in the tissue for longer period⁽¹⁰⁾. As recorded by Buckley and Fink they found that duration of nerve blocks produced by mixtures of local anesthetics and low molecular weight dextran is prolonged in rat infraorbital nerve blocks⁽¹¹⁾.

Hassan and his collogues studied the effects of adjuvant on duration of action of local anesthetics, they investigate the effect of wide ranges molecular weight dextran with adrenaline in rat infraorbital nerve block. They found that the duration of action of local anesthetics could be doubled and the , prolongation was dependent on the

Dextran Instead of Adrenaline to Prolong The Duration of Action of The Local Anesthetic in High Risk Patients

degree of block, the concentration of dextrans in the local anesthetic solution, and the molecular weight of the dextran⁽¹²⁾. However Kaplan mentions that lower molecular weight dextran prolong the duration of action of local anesthetic solution in the intercostal block via decreasing the systemic absorption⁽¹³⁾.

While, Alkhawajah and his colleagues, suggested that dextran reduces vascular uptake of lignocaine from epidural space and prolongs its duration of action, and they mention that the significance of these findings on systemic toxicity, dosage and onset of action of lignocaine needed to be investigated⁽¹⁴⁾.

Alhabooby in his study found that dextran 40000MW prolongs the duration of action of lignocaine when combined in epidural anesthesia⁽¹⁵⁾.

It can be concluded that the dextran adjuvant constitutes a protective mechanism against systemic toxic side effects on local anesthesia in comparison with adrenaline-containing anesthetic solutions. This effect is particularly significant in patients with pre-existing cardiovascular disease and when local anesthetic solutions are used in combination with volatile anesthetics⁽¹⁶⁾.

Curelaru and his colleagues concluded that using of Dextran-70 with xylocaine and percaïne, to lengthen the duration of the subarachnoid anesthesia had no acute irritative effect upon the central nervous system and its membranes as evaluated after seven days of its administration⁽¹⁷⁾. Our study found that the addition of dextran to the lignocaine had increase the duration of action of this local anesthetic and without symptoms or signs of toxicity on these patients in spite the fact that these patients had poor local circulation due to advanced atherosclerosis and vascular disease.

RECOMMENDATIONS

According to the results of this study it recommend that dextran 40000 MW as decongestant is the best choice when adrenalin is contra-indicated with local anesthetics for sciatic nerve block and three in one block and with no side effect. It is safe alternative choice for adrenaline–local anesthetic combination in patients with cardiovascular problems.

Tables

Table (1): Sex distribution of patients in both groups

Sex	Group 1	Percent	Group 2	Percent
Male	9	81.8	7	87.5
Female	2	18.2	1	12.5
Total	11	100.0	8	100.0

P value= 0.624

Table (2): Age distribution of patients in both groups

Age group\years	Group 1	Group2
65-70	7	5
71-75	2	1
76-80	2	2
total	11	8

Table (3): Comparison between the duration of block in both groups

Type of the Group	Duration of block		Total
	Less than 90 min.	Equal or More than 90 min.	
Group 1	05	06	11
Group 2	04	04	08
Total	09	10	19

P value= 0.605

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استخدام الدكستران بديلا عن الأدرينالين لإطالة مفعول المخدر الموضعي في المرضى ذوي الخطر العالي

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صممت هذه الدراسة لاستقصاء فعالية الدكستران ذو الوزن الجزيئي ٤٠٠٠٠ في إطالة مفعول المخدر الموضعي اللينوكين ٢% بدلا من الأدرينالين في المرضى شديدي الخطورة بعد كف العصب الوركي والكف العصبي الثلاثي. أظهرت النتائج عدم وجود فارق أي قيمة معنوية في فترة فعل المخدر الموضعي سواء استخدم مع الدكستران أو مع الأدرينالين وبناءا على نتائج هذه الدراسة فإن الدكستران بديل جيد للأدرينالين لزيادة مفعول المخدر الموضعي في المرضى ذوي الخطر العالي.

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