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Brachial Plexus Blockade and Chronic Renal Failure

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Brachial plexus regional blockades have been reported to have a 38% shorter duration of action in patients with chronic renal failure when the supra-clavicular approach is used.[1] We had the impression that such a difference was not present with the axillary approach. The present prospective study compares the latency and duration of analgesia after axillary block between patients with and without chronic renal failure.

MATERIALS AND METHODS

After informed consent for axillary blockade and for participation in the study, 67 patients of both sexes were studied. Thirty patients had chronic renal failure and 37 had normal renal function. Patients with chronic renal failure required anesthesia for the formation or repair of arterio-venous fistulas on the forearm, and those with normal renal function were patients with normal plasma creatinine values scheduled for orthopedic surgery on soft tissues of the hand or forearm.

A uniform axillary regional blockade technique was performed on all patients using a nerve stimulator.[2] The median, radial, ulnar, and musculocutaneous nerves were selectively localized by elicited characteristic muscle group movements secondary to each nerve stimulation, and selectively injected with local anesthetics. A current of 0.5 MA was used through a 22-gauge insulated pinpoint needle. The total volume of local anesthetics injected was 30 ml/m^2 of body surface area. The only anesthetic used was carbonated lidocaine 1% with freshly added epinephrine (1/200,000). Seventy-five percent of the total dose was injected in equal parts on the two principal nerves trunks innervating the surgical field, and the remaining 25% was injected in equal parts on the two other trunks.

Latency of analgesia was determined by dullness to pin-prick with a Wartenberg pinwheel at the surgical site, in the dermatome of the first nerve injected. Pin-prick was checked every minute after completion of the infiltration of that first nerve. Duration of analgesia was defined as the difference between the time of complete analgesia to pin-prick at the surgical site and the time of first sensation of pain at that site after surgery. The 67 patients of the study had complete analgesia after axillary blocks; complete analgesia was defined as having no discomfort at all during the surgery, without any iV drug supplementation. Each patient received 2.5–5 mg of diazepam iV before performance of the block.

For parametric data, an unpaired Student's t test was used for comparisons between groups. For non-parametric results the Mann-Whitney U-Test was used. The significance level was set at $P < 0.05$.

RESULTS

The two groups of patients were not different with respect to age, female/male ratio, and total volume of local anesthetic used (table 1). The plasma creatinine values were higher in patients with chronic renal failure and the hemoglobin values lower (table 1).

The latency of analgesia was not found to be different between the two groups (fig. 1). It was 8.5 ± 2.6 min (mean ± SD) for the patients with chronic renal failure and 8.3 ± 2.3 min for patients with normal renal func-

TABLE 1. Data Comparing Patients With and Without Renal Failure

	Patients With Chronic Renal Failure	Patients With Normal Renal Function	P Value
Age (yr)	53.3 ± 17	51.1 ± 10.1	N.S.
Sex (F/M)	20/10	18/19	N.S.
Creatinine (mg %)	10.4 ± 3.6	.87 ± .2	<.0005
Hemoglobin (gm %)	8.4 ± 1.1	14.2 ± 2.1	<.0005
Volume of local anesthetic	48.7 ± 6.2	51.5 ± 7.3	N.S.

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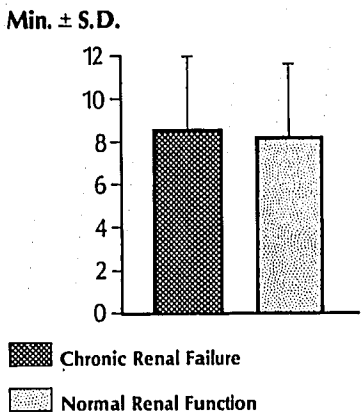

FIG. 1. Latency of analgesia to pin-prick (min ± SD), for the first nerve injected after axillary block in patient with chronic renal failure and in patients with normal renal function. P = N.S. (Student's *t* test).

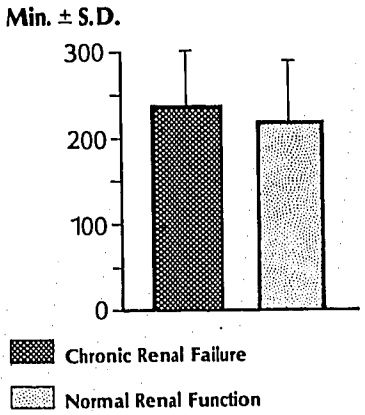

FIG. 2. Duration of analgesia (min ± SD) after axillary block in patients with chronic renal failure and in patients with normal renal function. P = N.S. (Student's *t* test).

tion. The duration of analgesia was not different between the two groups (fig. 2) with a duration of 234 ± 52 min for the patients with chronic renal failure and 211 ± 62 min for patients with normal renal function.

We estimated power from Lachin formula,[3] and it was found to be ≥.90 (α at .05, β at .10, $\sigma = 50$, $\Delta = 50$).

DISCUSSION

Our study does not confirm the results of the previous study comparing the duration of analgesia between patients with chronic renal failure and patients with normal renal function.[1] There are some differences between the two studies. The axillary approach is used in our study and the supraclavicular approach was used in the 1972 study.[1] Textbooks on regional anesthesia do not mention differences in duration of anesthesia between the two techniques; the duration of analgesia is attributed to the type of local anesthetic used and the presence of epinephrine.[4-6] The 1972 study[1] was partly retrospective for the patients with normal renal function and six different local anesthetic solutions were used. Our study is prospective and only one local anesthetic solution was used. The volume of local anesthetic used was constant in 1972.[1] We varied the volume according to the body surface. Otherwise, the same subjective criteria for latency and duration of analgesia were used in the two studies and the same kind of patients were studied with the same types of surgery. The difference in the results between the two studies could be related to those differences in methodology.

The shorter duration of analgesia in uremic patients (38%) was attributed to a higher cardiac index (40%) in uremic patients reported into another study.[7] We did not measure the cardiac output in patients, nor did the authors of the 1972 study.[1] However, chronic uremic patients seem to adapt to anemia, and cardiac failure secondary to hypertension, atherosclerosis, and altered volumes states occurs frequently.[8] Uremic neuropathy that may lead to slowing of conduction in proximal nerve trunks and plexus[9] is another finding that would lead to a relative sensitivity to local anesthetic and favor a more prolonged effect.

We conclude, in the context of our study, that latency and duration of analgesia are not significantly different between patients with chronic renal failure and patients with normal renal function.

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