Regional Anesthesia and Pain

The addition of tramadol to lidocaine does not reduce tourniquet and postoperative pain during *iv* regional anesthesia

[L'ajout de tramadol à la lidocaïne ne réduit pas la douleur du garrot pendant l'anesthésie iv régionale, ni la douleur postopératoire]

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Purpose: We conducted a prospective, randomized, double-blind study to determine whether the combination of tramadol with lidocaine 0.5% had an analgesic effect on tourniquet pain during *iv* regional anesthesia and also on postoperative pain.

Methods: Thirty patients scheduled for carpal tunnel decompression were included in the study. Each patient received 3 mg·kg⁻¹ of plain lidocaine 0.5% with 100 mg of tramadol (Group T) or 2 mL of isotonic saline (Group C). The mixture was injected into the isolated and exsanguinated arm. Pain was assessed using a linear visual analog scale and a verbal rate scale during the surgical procedure and the postoperative period (240 min) and subsequently at interview at 24 hr. Analgesic consumption was recorded.

Result: There was no difference in the pain scales and analgesic request at any of the time periods studied.

Conclusion: We conclude, therefore, that for carpal tunnel operation under *iv* regional anesthesia, the combination of tramadol and lidocaine is not more effective than lidocaine alone.

Objectif : Déterminer, par une étude prospective, randomisée et à double insu, si la combinaison de tramadol et de lidocaïne à 0,5 % produit un effet analgésique sur la douleur du garrot pendant l'anesthésie iv régionale et sur la douleur postopératoire.

Méthode : Trente patients devant subir la décompression du canal carpien ont participé à l'étude. Chacun a reçu 3 mg·kg⁻¹ de lidocaïne simple à 0,5 % combinée à 100 mg de tramadol (Groupe T) ou à 2 mL de solution saline isotonique (Groupe C). Le mélange a été injecté dans le bras isolé et exsanguiné. La douleur a été évaluée à l'aide

d'une échelle visuelle analogique linéaire et d'une échelle verbale pendant l'opération et 4 h et 24 h après l'opération, cette dernière évaluation faisant l'objet d'une entrevue. La consommation d'analgésique a été notée.

Résultats : Tous les scores de douleur et les besoins d'analgésiques ont été semblables d'un groupe à l'autre, et ce, pour tous les temps de mesures.

Conclusion : La combinaison de tramadol et de lidocaïne, utilisée pour l'anesthésie iv régionale pendant la compression du canal carpien, n'est pas plus efficace que la lidocaïne employée seule.

INTRAVENOUS regional anesthesia (IVRA) provides safe and effective anesthesia for hand surgery of one-hour duration or less. However, tourniquet pain and a lack of adequate postoperative analgesia limit its use. In an attempt to improve preoperative analgesia various adjuvants, such as opioids or clonidine, have been added to the local anesthetic solution with varying degrees of efficacy.¹⁻⁶ Initially it was thought that tramadol produces its antinociceptive and analgesic effects through spinal and supraspinal sites of action rather than via a local anesthetic action.⁷ However, recent studies suggest that tramadol might have a specific effect on peripheral nerves when used alone⁸ or when added to a local anesthetic.⁹ Considering a possible local analgesic

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effect similar to that of clonidine,⁶ we conducted a prospective study to examine the effect of tramadol combined with lidocaine for IVRA on the quality of regional block and postoperative analgesia.

Methods

After local Ethics Committee approval and written informed consent had been obtained, we studied 30 ASA I–II patients undergoing carpal tunnel decompression under IVRA in day-case surgery. Patients treated with opioids, tramadol, clonidine and related compounds, beta-blockers and calcium channel blockers were excluded. Patients were allocated randomly into two groups according to the anesthetic regimen and were not sedated during the procedure. After application of routine monitoring, a double tourniquet was positioned on the upper limb, which was then elevated and wrapped with an Esmarch bandage for exsanguination. Initially, the proximal tourniquet was inflated to 100 mmHg above the systolic arterial body pressure. All patients received 3 mg·kg⁻¹ of plain lidocaine 0.5% (Xylocaine®, Astra, France). Two millilitres of either isotonic saline in the control group (Group C) or 100 mg of tramadol (Topalgic®, Hoechst, France) was added to the lidocaine. Anesthetic solutions were administered by the anesthesiologist in a double-blind manner. When patients complained of pain at the tourniquet site, the distal tourniquet was inflated to the same pressure and the proximal one then deflated. Pain was assessed at the different tourniquet and surgical sites using a visual

analogue scale (VAS) graded from 0–100 mm and a verbal rating scale (VRS) graded as 0=no pain, 1=mild pain, 2=moderate pain, 3=severe pain and, 4=excruciating pain. Pain scoring was performed every 15 min after tourniquet placement and every 15 min after tourniquet release for a total of four hours. When patients complained of pain postoperatively, they received 1000 mg of paracetamol orally and were subsequently treated *prn* with the same drug before and after discharge. Phone interview of patient satisfaction on the day after surgery was graded as 0=dissatisfaction, 1=not much satisfaction, 2=satisfaction and 3=complete satisfaction.

We considered that a clinically significant benefit of using tramadol would be a reduction in the tourniquet pain score (VAS) of 15% compared to the lidocaine group control. Based on these estimates, we calculated a sample size that would permit a type I error of $\alpha=0.05$ with a type II error of $\beta=0.05$ and power of 80%. Enrollment of 15 patients in each group was required. Results are reported as mean $\pm$ SD and median. Data were analyzed using the Mann-Whitney U test for patient data, for median and ranks of VAS and VRS scores. The number of patients not given paracetamol was compared using the Kaplan-Meier method and a log rank test.

Results

There was no significant difference between groups in patient demographic data (age: 45 $\pm$ 11 *vs* 52 $\pm$ 18 yr; weight: 71 $\pm$ 7 *vs* 68 $\pm$ 15 kg; height: 166 $\pm$ 16 *vs* 161

TABLE I Visual analogue scale (VAS) and verbal rating scale (VRS) for pain at the site of the proximal tourniquet (PT), distal tourniquet (DT) and surgery (Surg) at time T0, T15 min and at time of tourniquet deflation (T defl) for control (Group C) and tramadol groups (Group T; mean value $\pm$ SD or median and range). $P>0.05$

	T (min)			T1 (min)			T def (min)	
	PT	DT	Surg	PT	DT	Surg	PT	DT
VAS (0–100)								
Group C	0 $\pm$ 0	15 $\pm$ 21	9 $\pm$ 17	25 $\pm$ 7	22 $\pm$ 11	7 $\pm$ 14	26 $\pm$ 14	26 $\pm$ 15
Group T	0 $\pm$ 0	11 $\pm$ 16	3 $\pm$ 10	15 $\pm$ 7	32 $\pm$ 25	6 $\pm$ 11	24 $\pm$ 17	21 $\pm$ 20
VRS (0–4)								
Group C	0 (0–2)	1 (0–2)	1 (0–2)	1 (0–3)	1 (0–3)	1 (0–2)	2 (1–4)	2 (0–4)
Group T	0 (0–2)	2 (0–3)	0 (0–1)	2 (0–4)	2 (0–4)	1 (0–2)	3 (1–4)	2 (0–4)

TABLE II Visual analogue scale (VAS) and verbal rating scale (VRS) for pain during the postoperative period (T min) for control (C Group) and tramadol groups (T Group; mean value $\pm$ SD or median and range). $P>0.05$

	T0	T30	T60	T90	T120	T150	T180	T240
VAS Group C	0 $\pm$ 15	31 $\pm$ 19	20 $\pm$ 13	15 $\pm$ 12	17 $\pm$ 11	17 $\pm$ 9	15 $\pm$ 8	37 $\pm$ 15
(0–100) Group T	0 $\pm$ 22	32 $\pm$ 17	47 $\pm$ 18	36 $\pm$ 15	31 $\pm$ 13	27 $\pm$ 15	26 $\pm$ 15	28 $\pm$ 13
VRS Group C	0 (0–1)	0 (0–2)	2 (0–4)	1 (0–3)	1 (0–2)	0 (0–1)	1 (1–3)	3 (2–4)
(0–4) Group T	1 (0–3)	2 (0–3)	2 (1–3)	2 (0–3)	2 (1–3)	2 (0–3)	2 (1–3)	2 (1–3)

± 7 cm; and sex ratio: 8/7 *vs* 9/6 sex ratio for Group C *vs* Group T, respectively), length and type of surgery (28 ± 10 and 30 ± 9 min for Group C and Group T, respectively). Duration of application of the proximal tourniquet (19 ± 4 and 21 ± 4 min for Group C and Group T, respectively) and of the distal tourniquet (29 ± 6 and 27 ± 4 min for Group C and Group T, respectively) were similar in the two groups. VAS and VRS scores for tourniquet pain (Table I) and surgical sites show results comparable in the two groups and the pain scores remained comparable during the postoperative period (Table II). The duration of postoperative analgesia (delay before the first paracetamol request) was increased slightly but not significantly with tramadol (110 ± 70 and 130 ± 20 min for Group C and Group T, respectively; $P=0.08$). There was no significant difference in the satisfaction scores between the groups during the home follow-up (complete satisfaction 13 *vs* 13%; satisfaction 73 *vs* 80%, not much satisfaction 13 *vs* 7% for Group C *vs* Group T). Arterial pressure, heart rate, respiratory rate, pulse oxymetry and sedation scores remained stable during the study. In none of the groups did patients complain of postoperative nausea and vomiting.

Discussion

Adding tramadol to lidocaine for IVRA does not improve the intraoperative tolerance to tourniquet and the postoperative pain despite the tramadol's analgesic properties.

Tourniquet pain is generally considered the main factor limiting the time IVRA can be used for upper limb surgery. The mechanism of tourniquet pain remains unclear despite the role of A fibres and unmyelinated C fibres.¹¹ It has been suggested that compounds with a local anesthetic activity like meperidine⁵ or clonidine⁶ added to local anesthetic solutions in IVRA may be of benefit to reduce tourniquet and postoperative pain.

Being a racemic mixture with each enantiomer acting at a different site of the pain control pathways (μ opioids-receptor, inhibition of norepinephrine and serotonin reuptake), tramadol acts centrally to reduce pain.¹⁰ However, in a study on volunteers, the intradermal injection of tramadol depressed the sensation to pinprick, touch, and cold similarly to the intradermal injection of plain 1% lidocaine.⁷ Pang *et al.* suggested that the local anesthetic effect of tramadol could be useful to reduce the pain associated with the infusion of propofol.¹² It has been suggested that tramadol added to mepivacaine prolongs the duration of sensory and motor block of brachial plexus anesthesia.⁹

In volunteers, the absence of local anesthetic effect of tramadol used as the sole agent in IVRA has been

reported.¹³ Though it was suggested in that study that tramadol added to local anesthetics might provide a significant effect on the onset and recovery of the touch sensation, similar results were not observed for pinprick and cold sensations, or for motor blockade. Side effects with tramadol were also significant.¹³ The specific action of tramadol on nerve fibre remains to be established.

The lack of analgesic effect of tramadol in the postoperative period may be due to a local degradation of the compound in the exsanguinated arm resulting in the absence of central effect and the lack of side effects including nausea and vomiting. The fact that in Group T the VAS scores tended to be higher (without a statistically significant difference) than in the control group during the first 180 min in the postoperative period must be interpreted with caution. Because the postoperative VAS was not the main evaluation criteria, the number of patients was probably too small to perform this evaluation. However, our results suggest tramadol does not reduce tourniquet or postoperative pain when combined to a local anesthetic for IVRA.

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