European Society of
Regional Anaesthesia
& Pain Therapy

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XXIX CONGRESSO NAZIONALE

ESRA Italian Chapter

CESENA, Cesena fiere

7-9 Novembre 2024

Presidente del congresso
Vanni Agnoletti
Domenico Pietro Santonastaso
Andrea Tognù

MZ EVENTS

European Society of Regional Anaesthesia & Pain Therapy
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XXIX CONGRESSO NAZIONALE
7-9 Novembre 2024
CESENA, Cesena fiere

Armi non convenzionali: il ruolo di Ketamina, Dex e Steroidi

Giulia Pedini

S.C. Anestesia e Rianimazione Cardiotoracovascolare e Medicina del Dolore

A.O.U. Santa Maria della Misericordia Perugia

Azienda Ospedaliera di Perugia

Uncontrolled pain can cause:

- ↓ patient satisfaction,
- ↑ pulmonary and cardiac complications,
- Delayed ambulation,
- Delirium
- Chronic pain,
- ↑ morbidity and mortality

Kummer I et all. Adjuvant Analgesics in Acute Pain – Evaluation of Efficacy. Curr Pain and Head Rep. 2024

Table 1 Risk factors for chronic pain syndromes

Surgery
• Intraoperative nerve damage
• Open surgical approach vs. laparoscopic approach
• Surgery duration > 3 h
• Volatile general anesthesia
Chronic opioid use, opioid-induced hyperalgesia (OIH)
• High-dose opioid use
Patient factors
• Pre-existing pain syndromes
• Genetic predispositions (i.e., polymorphisms of voltage-gated Na+, Ca+ channels)
• Mood disorders, anxiety
• Personality disorders
• Female
• Obesity
• Young age

Opioids:

- Sedation
- Respiratory depression,
- Nausea and vomiting (PONV),
- Constipation,
- Pruritus,
- Secondary hyperanalgesia,
- ↑ hospitalization

Kummer I et all. Adjuvant Analgesics in Acute Pain – Evaluation of Efficacy. Curr Pain and Head Rep. 2024

Opioid-free anaesthesia:

multimodal or

balanced

analgesia

ERAS protocols:

- Neuraxial anaesthesia
- Peripheral nerve blocks
- Non-opioid adjuncts

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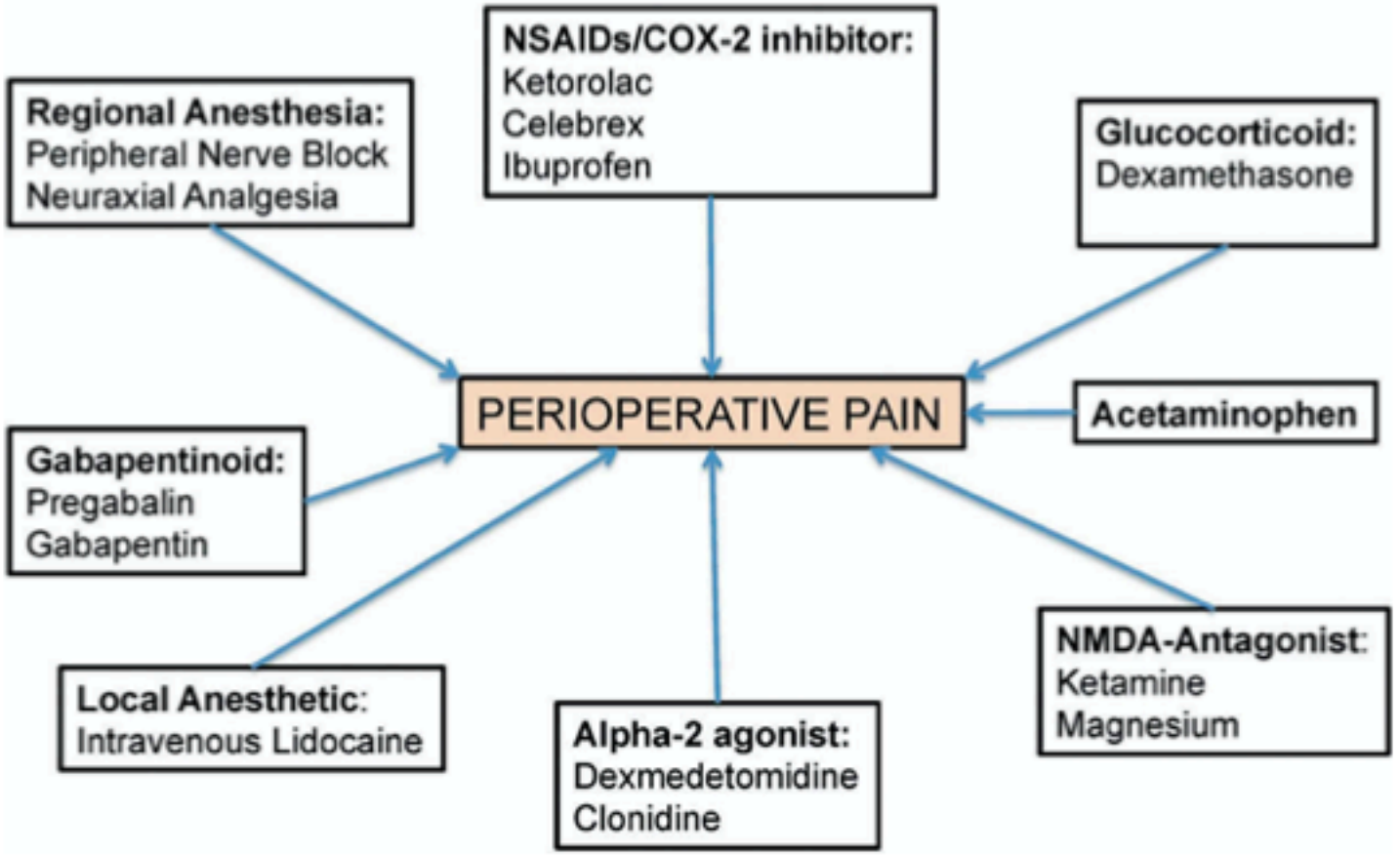
Multimodal Opioid-Sparing Analgesia



- ✓ Chemical compatibility with LA
- ✓ ↓ in effective LA's dose
- ✓ Dose – response relationship
- ✓ Independent analgesic activity
- ✓ ↑ pain relief and ↓ opioid doses
- ✓ ↓ onset-time of motor and sensory blockade
- ✓ ↑ quality of sensory blockade
- ✓ ↑ duration of sensory blockade, but NO prolongation of motor blockade
- ✓ ↑ duration of analgesia
- ✓ Absence of systemic adverse effects (chondrotoxic, myotoxic and neurotoxic)

Pak DJ et all. Chronification of Pain: Mechanisms, Current Understanding, and Clinical Implications. Current Pain and Headache

Local anaesthetic adjunct	Evidence
Midazolam	Limited effectiveness on perineural administration *vivo* er
Fentanyl	erineural ivacaine rdia and
Morphin	erineural r systemic
Tramado	erineural r systemic
Ketamine	Lack of effectiveness on perineural administration Neurotoxicity demonstrated *in vitro* and *in vivo* Side effects include drowsiness, hallucinations and nausea
Neostigmine	Lack of effectiveness on perineural administration Neurotoxicity demonstrated *in vitro* and *in vivo* Side effects including nausea and vomiting

Agent	Criteria for Inclusion[1]	Strength of Study Evidence[2]: a-Quality/Quantity; b-Consistency; c-Significance	Summary/Recommendations	Grade of Recommendation (level of evidence)[3]
Epinephrine	Attestation	a- 3/3; b- 66%; c- low (no more than 1h)	May prolong blockade by a minimal amount (45–60min). High doses can result in systemic absorption, tachycardia, and hypertension. Avoid use in patients with preexisting neurovascular	A (1b)
Clonidine	Attestation	a- 6/7; b- 43%; for bupivacaine	oes not her block. nsion,	A (1a, 1b)
Dexmedetomidine	IND; Attestation	a- 7/7; b- 100%	m 1–8h etic. ificant.	A (1a, 1b)
Dexamethasone	IND; Attestation	a- 6/6; b- 50% (control, 0% with c- moderate (1-	s nerve nilar ay ith high ers blocks s.	A (1a, 1b)
Tramadol	Attestation	a- 8/8; b- 50%; (40–160min, 3 studies); high with ISB (7h, 1 study).	gation of analgesia or nerve blockade. Not recommended due to lack of evidence of clinically significant efficacy and potential to increase sedation and PONV.	A (1b)
Magnesium	Attestation	a- 3/5; b- 100%; c- low for brachial plexus (1–2.5h, 4 studies); high for FNB (10h for analgesic request, 1 study)	Consistently shown to prolong PNB but likely not clinically significant for brachial plexus blocks. One study of moderate quality (Jadad III) suggests significantly increased duration of analgesia for FNB. Further high-quality studies needed to determine toxicity profile and minimal effective dose. Concern for PONV at 200mg dose. Not recommended at this time.	A (1b)

Table 3. Comparison of the characteristics of an ideal local anaesthetic adjunct with perineural dexamethasone and dexmedetomidine

Characteristics of an ideal local anaesthetic adjunct	Dexamethasone	Dexmedetomidine
Available as a preservative-free preparation	+	+
Chemically compatible with local anaesthetics	+[a]	+
Plausible mechanism of action	+	+
Effective for all peripheral nerve blocks	+	+
Evidence of dose response relationship	+	–
Increase in the duration of sensory blockade	+	+
No prolongation of motor blockade	–	–
Differential sensorimotor blockade prolongation	+	–
Increase in the duration of analgesia	+	+
No significant systemic adverse consequences	+	–
No chondrotoxic, myotoxic and neurotoxic side effects	+	?

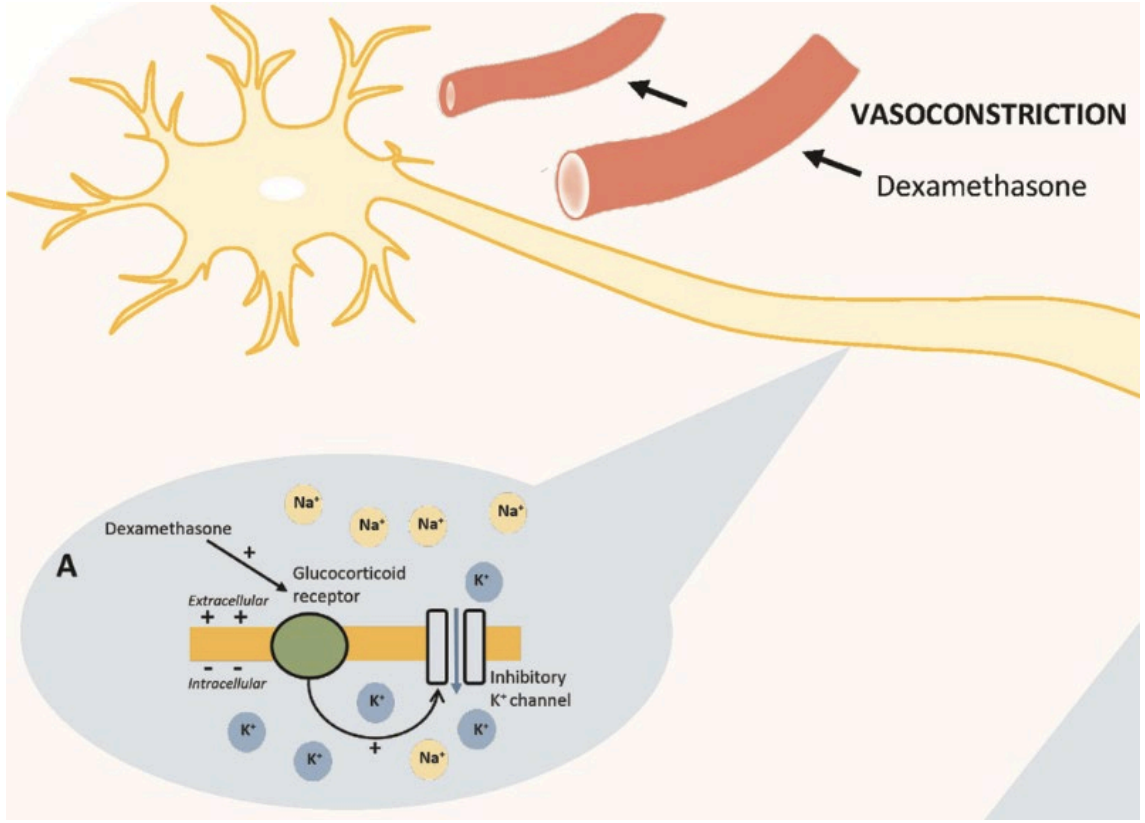
?, unclear; –, no; +, yes.
[a]Dexamethasone has been shown not to have *in vitro* compatibility with ropivacaine.

DEXAMETHASONE

High-potency, long-acting glucocorticoid

(little mineralocorticoid effect)

Long-term treatment is associated with many side effects (adrenal insufficiency, hypertension, osteoporosis, delayed wound healing, hyperglycaemia, diabetes mellitus)



↓ nociceptive C-fibre activity:

- Direct effect on glucocorticoid receptors
- ↑ the expression of inhibitory K+ channels

Local vasoconstrictive effect:

- ↓ LA absorption
- ↓ systemic inflammation (TNF-α, IL-1B, PCR)
- ↓ prostaglandin synthesis by inhibiting PL enzyme and COX-II
- ↓ excitability of nerve cells (↓ glutamate release and ↑ release of γ-aminobutyric acid)

Desaia N, Albrechtc E. Local anaesthetic adjuncts for peripheral nerve blockade. www.co-anesthesiology.com. 2023

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XVIV CONGRESSO NAZIONALE

7-9 Novembre 2024

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REVIEW ARTICLES

Co-administration of dexamethasone with peri...nal nerve block: intravenous vs perineural ...matic review, meta-analysis, ...l-sequential analysis

Comment > Acta Anaesthesiol Scand. 2016 Aug;6... Epub 2016 Jun 3.

...eks[2], R. Rossaint[4] and

Dexamethasone ... following knee ... controlled study

> Hand (N Y). 2024 Sep 11:1558944724127067... Online ahead of print.

Efficacy of Direct Versus Peripheral ... Dexamethasone on Duration and ... ...l Anesthesia for Outpatie...

A A Sherif [1], H E Elsersy [1]

> Reg Anesth Pain Med. 2023 Jun 9:rapm-2023-104646. doi: 10.1136/rapm-2023-104646. Online ahead of print.

Addition of dexamethasone to prolong peripheral nerve blocks: a ChatGPT-created narrative review

Christopher L Wu [1 2 3], Brian Cho [4], Rodney Gabriel [5], Robert Hurley [6], Jiabin Liu [7], Edward R Mariano [8 9], Vineesh Mathur [4], Stavros G Memtsoudis [10 2], Michael Conrad Grant [4]

Case Reports > Cureus. 2024 Apr 16;16(4):e58394. doi: 10.7759/cureus.58394. eCollection 2024 Apr.

Ultrasound-Guided Regional Anesthesia Using a Mixture of Dexamethasone, Dexmedetomidine, and o.2% Levobupivacaine for Bilateral Breast Cancer S... ...a Spontaneous Breathing Opioid-Fr...

...(12):1465-1471.

...on of ...ngle ...ar

Cochrane Library

Cochrane Database of Systematic Reviews

Dexamethasone as an adjuvant to peripheral nerve block (Review)

Pehora C, Pearson AME, Kaushal A, Crawford MW, Johnston B

Mar 1;136(3):4...

M Maa... M F Leth [1], ... C Zamany [6], P Tou...

...k with Liposomal ...d Bupivacaine with ...methasone: A Noninferiority Trial

David H Kim [1], Jiabin Liu [1], Jonathan C Beathe [1], Yi Lin [1], Douglas S Wetmore [1], Sang J Kim [1], Stephen C Haskins [1], Sean Garvin [1], Joseph A Oxendine [1], Michael C Ho [1], Answorth A Allen [2], Marko Popovic [1], Ejiro Gbaje [1], Christopher L Wu [1], Stavros G Memtsoudis [1]

...ded Study

...[2], Armen Voskerijian [3 4], Mark L Wang [1], Pedro K Beredjiklian [1],

- ↑ the mean duration of sensory blockade
- ↑ the mean duration of motor blockade
- ↑ the mean duration of analgesia
- ↓ pain score at rest and on movement
- ↓ post-operative analgesic consumption

Kummer I et all. Adjuvant Analgesics in Acute Pain – Evaluation of Efficacy. Curr Pain and Head Rep. 2024

> J Med Imaging Radiat Oncol. 2015 Oct;59(5):571-7. doi: 10.1111/1754-9485.12333. Epub 2015 Jun 15.

Ropivacaine and dexamethasone: a potentially dangerous combination for therapeutic pain injections

Trevor William Watkins [1 2], Simon Dupre [3 2], John Richard Coucher [1]

A multicenter, randomized comparison between 2, 5, and 8 mg of perineural dexamethasone for ultrasound-guided infraclavicular block

Daniela Bravo,[1] Julian Aliste,[1] Sebastián Layera,[1] Diego Fernández,[1] Prangmalee Leurcharusmee,[2] Artid Samerchua,[2] Amornrat Tangjitbampenbun,[3] Arraya Watanitanon,[3] Vanlapa Arnuntasupakul,[4] Choosak Tunprasit,[4] Aida Gordon,[3] Roderick J Finlayson,[3] De Q Tran[3]

- ✓ 5 mg provided a longer analgesic duration than 2 mg
- ✓ 5 and 8 mg provide clinically equivalent sensorimotor and analgesic durations

Reg Anesth Pain Med. 2019

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REVIEW ARTICLES

Co-administration of dexamethasone with peripheral nerve block: intravenous *vs* perineural application: systematic review, meta-analysis, meta-regression and trial-sequential analysis

M. Heesen[1,*], M. Klimek[2], G. Imberger[3], S.E. Hoeks[2], R. Rossaint[4] and S. Straube[5]

I.V. dexamethasone has also been shown to reduce pain at rest and with movement and opioid consumption after surgery when compared with placebo.

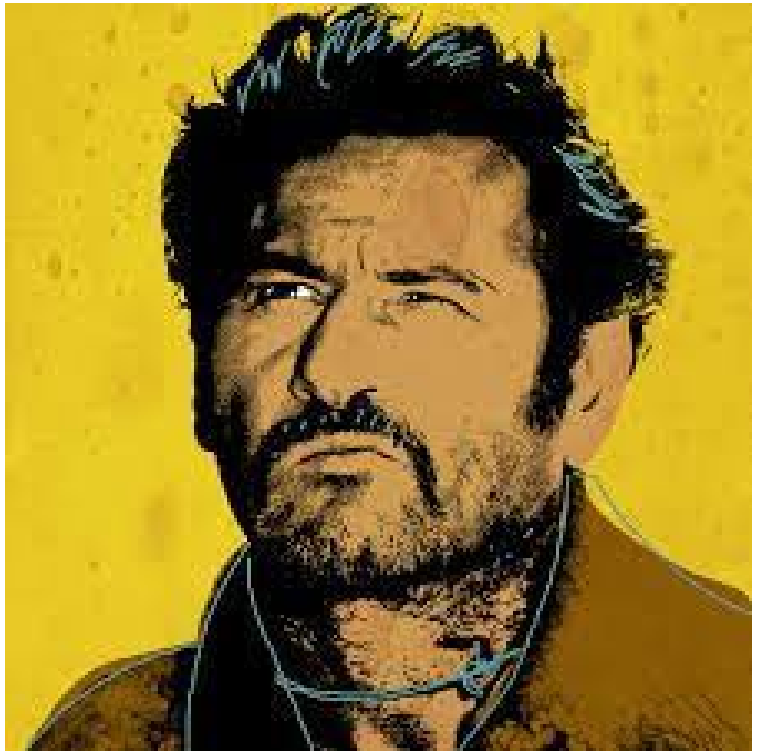
In perineural group:

- ✓ ↑ duration of sensory block
- ✓ ↑ duration of motor block
- ✓ ↑ duration of analgesia (statistically significant)

No difference for opioid consumption in the first 24 h

BJA. 2018

DEXMEDETOMIDIN E

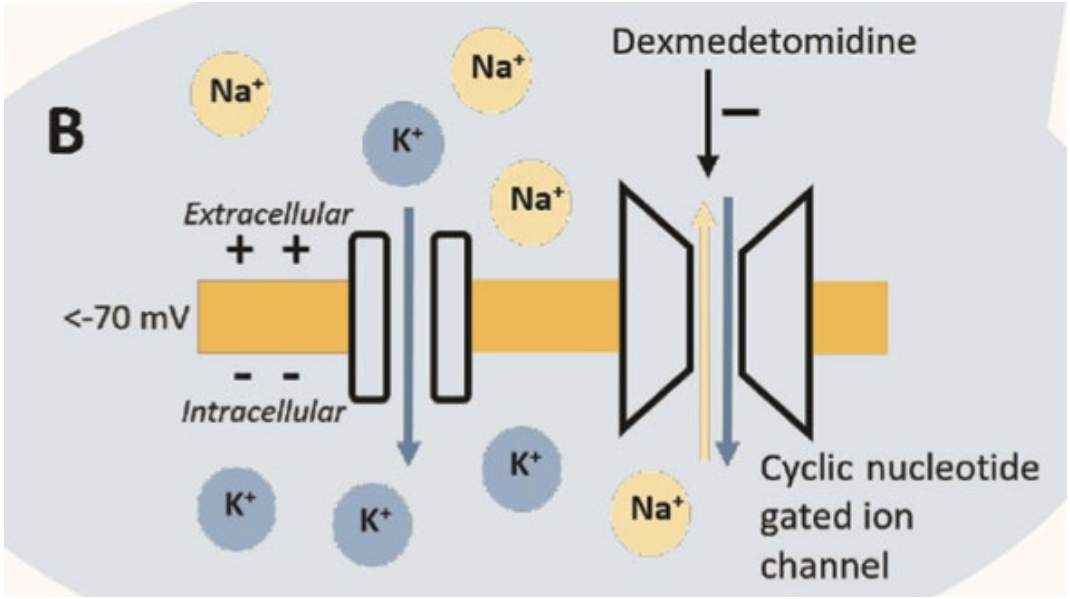


Highly selective α2 adrenergic receptor agonist

Effects:

- Sedative, hypnotic,
- Anxiolytic,
- Analgesic,
- Anti-inflammatory,
- Perioperative sympatholytic,
- Anesthetic-sparing

Adverse effects: bradycardia, hypotension and sedation



- ✓ Inhibition of hyperpolarization-activated nucleotide gated channels maintaining the neurone at a more negative potential and hyperpolarized state (inhibiting the next action potential in C and Aδ fiber)
- ✓ Activating α2-adrenoceptors in peripheral blood vessels: vasoconstriction, ↓ absorption of LA and ↑ their block time

Desaia N, Albrechtc E. Local anaesthetic adjuncts for peripheral nerve blockade. www.co-anesthesiology.com. 2023

- ✓Analgesic effect: stimulation of α2-receptors in the dorsal horn of the spinal column, leading to the inhibition of nociceptive neurons and ↓ in the release of substance P, glutamate an NA
- ✓↓ sympathetic activity: activation presynaptic α2-adrenoceptors in the vasomotor centre of the brainstem
- ✓↓ perioperative stress and inflammation and preserves immune function
- ✓Hypnotic effect without ventilatory depression: hyperpolarization of the non-adrenergic neurons which leads to depression of neuronal firing in the locus ceruleous together with suppression of the release of NA because of the stimulation of the central adrenergic receptors

Kummer I et all. Adjuvant Analgesics in Acute Pain – Evaluation of Efficacy. Curr Pain and Head Rep. 2024

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Pain Physician 2020; 23:271-281 • ISSN 1533-3159

Randomized Trial

Dexmedetomidine Added to Bupivacaine versus Bupivacaine in Transincisional Ultrasound-Guided Quadratus Lumborum Block in Open Renal Surgeries: A Randomized Trial

Amin M. Alansary, MD[1], Atef Badawy, MD[2], and Marwa A.K. Elbeialy, [illegible]

Evidence basis for us
to enhance the quali
a systematic review and me
controlled trials

L. Vorob[illegible]

Minerva Anestesiologica 2[illegible]
DOI: 10.23736/S0375-9393.17.11[illegible]

ORIGINAL ARTICLE

Efficacy of US-guided transversus abdominis plane block and rectus sheath block with ropivacaine and dexmedetomidine in elderly high-risk patients

Lili XU [1, 2, 3], Zhiyong HU [4] *, Jianjun SHEN [3], Patrick M. MCQUILLAN [5]

Anesth Pain [illegible]
Published online 2021 [illegible]

EXPERIMENTAL AND THERAPEUTIC MEDICINE 19: 2535-2542, 2020

Dexmedetomidine comb[illegible]
trasound-guided tr[illegible]
improves pos[illegible]
f[illegible]

BMC Anesthesiology

ivacaine in
plane block
ecovery

Alseoudy et al. BMC Anesthesiology (2024) 24:120
https://doi.org/10.1186/s12871-024-02504-x

Open Access

RESEARCH

The value of local dexmedetomidine as an adjuvant to ultrasound-guided wide awake local anesthesia no tourniquet (WALANT) in flexor tendon repair surgeries: a randomized controlled trial

Mahmoud Mohammed Alseoudy[1*], Elsayed Mohamed Abdelkarime[1], Khaled Nour[2] and May Elsherbiny Badr[1]

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ial Plexus Block
Randomized Controlled Trials

[illegible], BS,* Charles Andrew Ferreri,† Amit Atrey, MD, MSc, FRCS,‡
[illegible]rin, MD,|| and Amaresh Vydyanathan, MD§

etomidine Added to Ropivacaine for Ultrasound-guided Erector Spinae Plane Block Prolongs Analgesia Duration and Reduces Perioperative Opioid Consumption After Thoracotomy

ized, Controlled Clinical Study

MD,* Huixian Li, MD,* Shijing Wei, BSN,*
heng Ni, MD,* Li Sun, MD,† and Hui Zheng, MD*

Comparison of Intercostal Nerv
Ropivacaine-Dexmedetomidin
Patients Undergoing Thoracot

Kamran Mahmoudi [1], Mahboobeh Rashi
and Parisa Rashidi [5,**]

ivacaine and

Addition of dexmedetomidine to bupivacaine in ultrasonography-guided paravertebral blockade potentiates postoperative pain relief among patients undergoing thoracotomy

Cihangir Biçer[a], Esra Nur Ünalan[a], Recep Aksu [a,*], Ömer Önal[b], Işın Güneş[a]

- ↓ the mean time to onset of sensory blockade
- ↓ the mean time to onset of motor blockade
- ↑ the mean duration of sensory and motor blockade (?)
- ↑ duration of analgesia
- ↓ post-operative analgesic consumption
- ↑ patient satisfaction
- No dose – response relationship 0.5-1 mcg/kg (10 – 150 mcg)

Journal of Clinical Medicine
MDPI

Systematic Review

Dexmedetomidine as an Adjuvant to Nerve Block for Cancer Surgery: A Systematic Review and Meta-Analysis

Christrijogo Soemartono Waloejo [1], Dian Anggraini Permatasari Musalim [2], David Setyo Budi [2], Nando Reza Pratama [3], Soni Sunarso Sulistiawan [1] and Citrawati Dyah Kencono Wungu [4,5,*]

- Protective effect on the incidence of postoperative delirium and POCD
- Significant ↓ in the incidence of PONV

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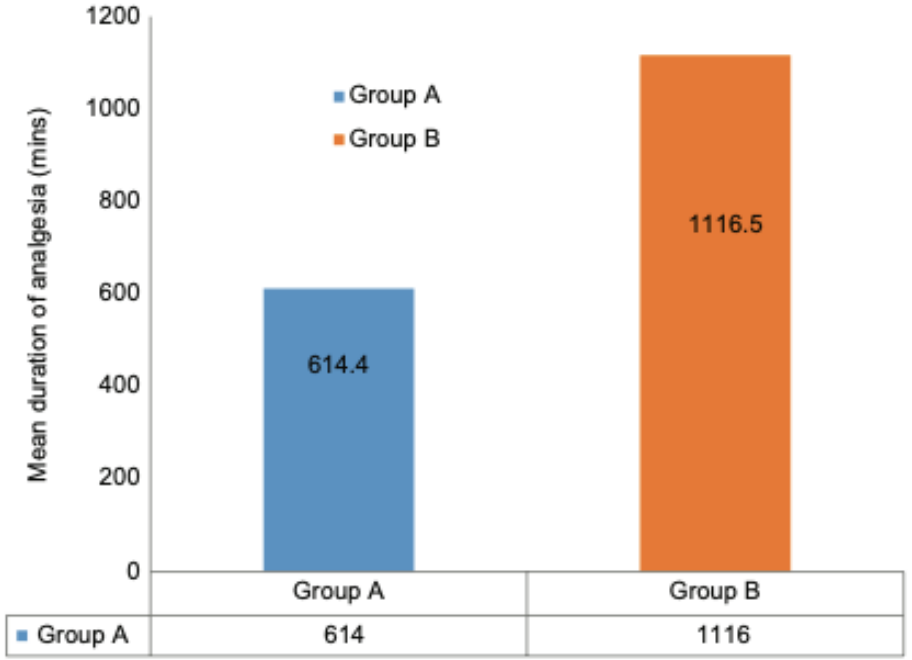
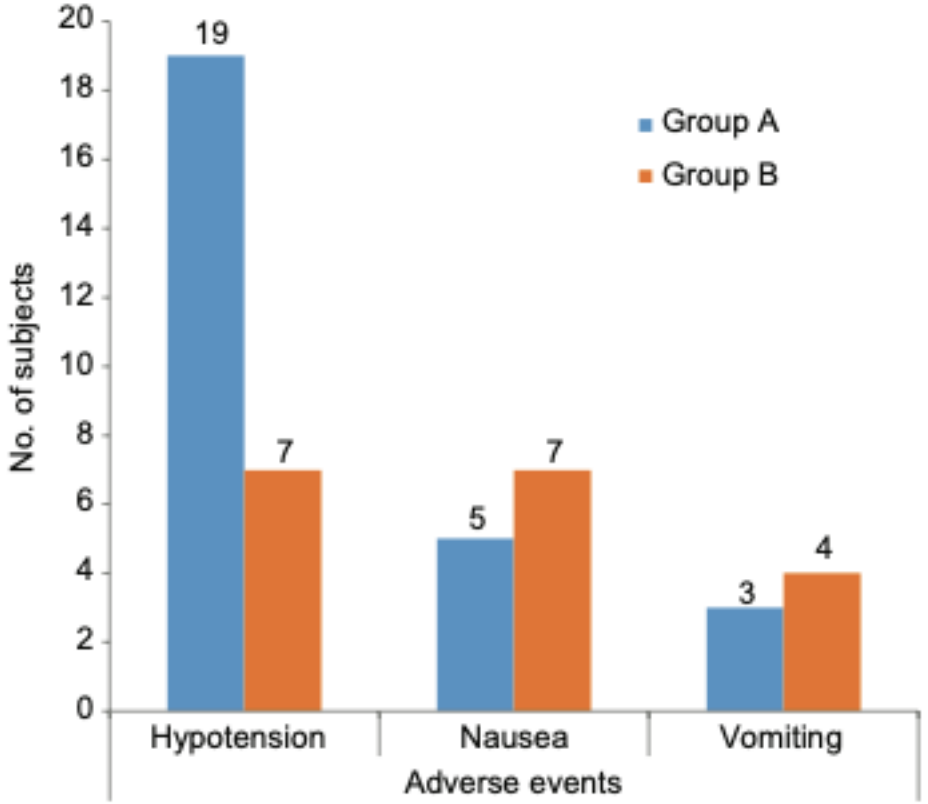
A comparison of efficacy of parenteral and perineural dexmedetomidine with 0.25% ropivacaine for post-thyroidectomy analgesia using bilateral superficial cervical plexus block

Neena Jain, Pooja R. Mathur, Kriti Lakhina, Veena Patodi, Kavita Jain, Deepak Garg





J Anaesth Clin Pharm.

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Open Access Case Report

DOI: 10.7759/cureus.10703

Synergistic Effect of Perineural Dexamethasone and Dexmedetomidine (Dex-Dex) in Extending the Analgesic Duration of Pectoral Type I and II Blocks

Robert P. Zusman [1], Ivan Urits [2], Alan D. Kaye [3], Omar Viswanath [4], Jonathan Eskander [5]

Open Access Case Report

DOI: 10.7759/cureus.9473

Synergistic Effect of Perineural Dexamethasone and Dexmedetomidine (Dex-Dex) Prolong Analgesic Effect of a Preoperative Interscalene Block

Nazir A. Noor [1], Ivan Urits [2], Omar Viswanath [3], Alan D. Kaye [4], Jonathan Eskander [5]

clinics and practice

MDPI

Case Report

Synergistic Effects of Dexamethasone and Dexmedetomidine in Extending the Effects of Pectoral I and Pectoral II Blocks for Postoperative Analgesia Following Total Mastectomy with Lymph Node Dissection

Ahish Chitneni [1], Jamal Hasoon [2,*], Ivan Urits [2], Omar Viswanath [3,4,5,6], Alan D. Kaye [6] and Jonathan Eskander [7]

Open Access Case Report

DOI: 10.7759/cureus.11917

Use of Dexmedetomidine With Dexamethasone for Extended Pain Relief in Adductor Canal/Popliteal Nerve Block During Achilles Tendon Repair

Hisham Kassem [1], Ivan Urits [2], Omar Viswanath [3], Alan D. Kaye [4], Jonathan P. Eskander [5]

European Society of Regional Anaesthesia & Pain Therapy
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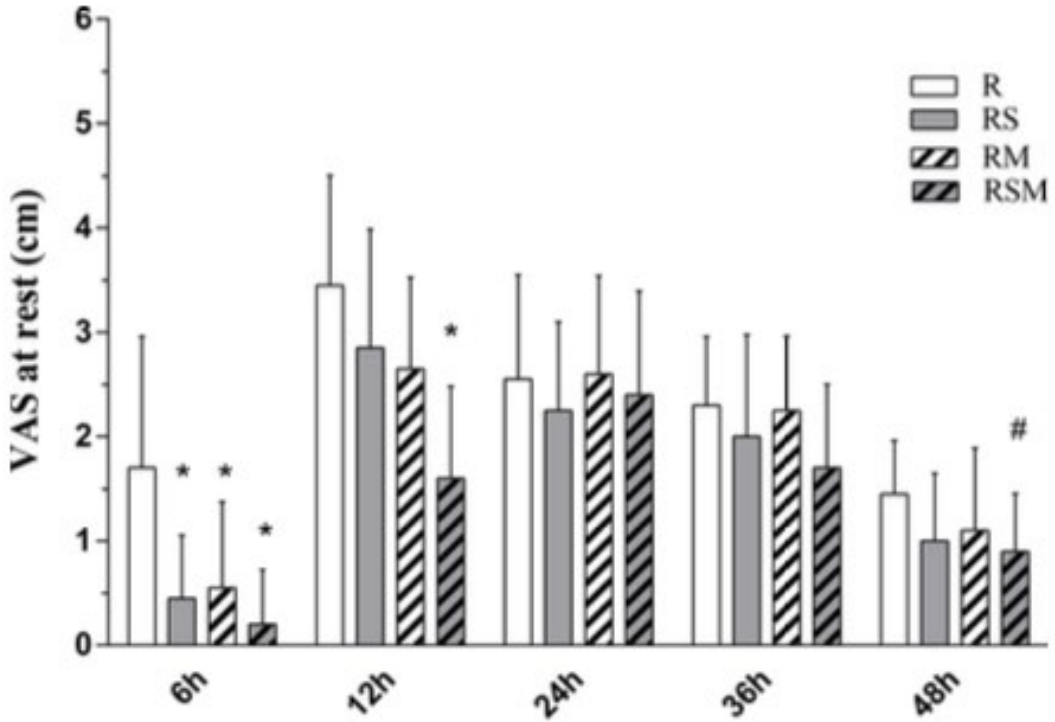
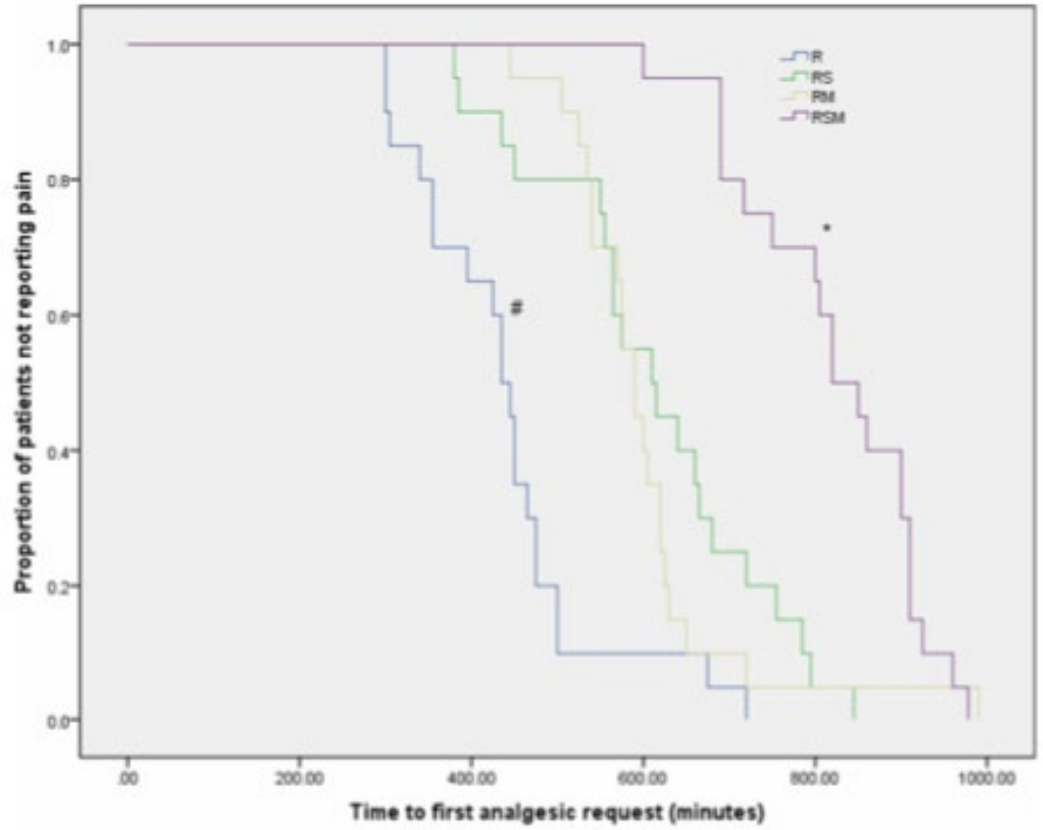
Dexamethasone and dexmedetomidine as adjuvants to local anesthetic mixture in intercostal nerve block for thoracoscopic pneumonectomy: a prospective randomized study

Panpan Zhang,[1] Shijiang Liu,[2] Jingming Zhu,[2] Zhuqing Rao,[2] Cunming Liu[2]





Reg Anesth Pain Med

KETAMINE

- Non-competitive NMDA receptor antagonist
- Effects:
- Analgesic,
- Anti-hyperalgesic,
- Prevents central sensitization,
- ↓ opioid tolerance
- Side effects: neuropsychiatric, psychomimetic (hallucinations, vivid dreams, diplopia, blurred vision, nystagmus, or dysphoria), nausea and/or vomiting, sedation

- Applied topically or peripherally inhibit the sensory nerves
- ↓ pro-inflammatory cytokine formation (TNF-α, IL-6)
- Inhibits Na+ channels (local anesthetic characteristics)
- Glutamate activates NMDA receptors in the spinal cord causing central sensitization

Potentiates LA effect by ↓ the start of sensory and motor block, and at the same time it ↓ the duration and extent of motor block

Kummer I et all. Adjuvant Analgesics in Acute Pain – Evaluation of Efficacy. Curr Pain and Head Rep. 2024

Acta Anaesthesiol Scand 2002; 46: 821–826
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ACTA ANAESTHESIOLOGICA SCANDINAVICA
0001-5172

No enhancement of sensory and motor blockade by ketamine added to ropivacaine interscalene brachial plexus blockade

Il-Ok Lee[1], Woo-Kyung Kim[2], Myung-Hoon Kong[1], Mi-Kyung Lee[1], Nan-Sook Kim[1], Young-Seok Choi[1] and Sang-Ho Lim[1]

30 mg of ketamine to 30 ml of 0.5% ropivacaine for an IBP block

- ✓ No improvement in the onset or duration of sensory block
- ✓ ↑ incidence of psychotomimetic adverse effects

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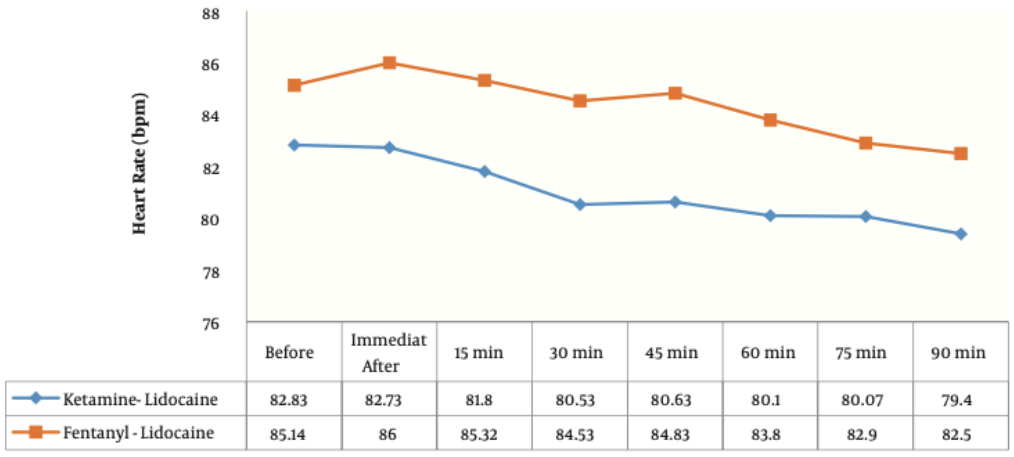
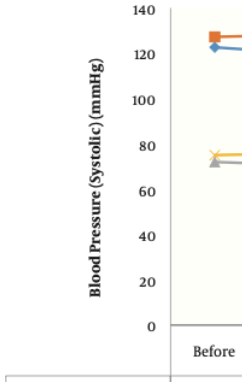
Anesth Pain Med. 2019 December; 9(6):e92695. doi: 10.5812/aapm.92695.
Published online 2019 December 1. Research Article

Comparison of the Ketamine-Lidocaine and Fentanyl-Lidocaine in Postoperative Analgesia in Axillary Block in Upper Limb Fractures By Ultrasound Guidance

Reza Akhondzadeh[1], Mahboobe Rashidi[1,*], Mohammadreza Gousheh[1], Alireza Olapour[1] and Bahrammohamad Tasbihi[1]



	Before	Immediat After	15 min	30 min	45 min	60 min	75 min	90 min
Ketamine- Lidocaine	82.83	82.73	81.8	80.53	80.63	80.1	80.07	79.4
Fentanyl - Lidocaine	85.14	86	85.32	84.53	84.83	83.8	82.9	82.5



	Before							
Ketamine - SBP	122.67							
Fentanyl - SBP	127.32							
Ketamine - DBP	72.13							
Fentanyl - DBP	75.14	76.08	74.12	71.73	72.53	71.8	75.24	74.22

Table 2. Comparison of Postoperative Pain Intensity at Different Times in the Two Groups[a]

Different Time Points After Surgery	Pain Scores (Measured by VAS)		P Value
	Ketamine	Fentanyl	
15 min	0.00 ± 00	0.00 ± 00	-
30 min	0.00 ± 00	0.00 ± 00	-
One hour	0.1 ± 0.0	0.1 ± 0.1	0.82
Two hours	0.1 ± 0.1	0.2 ± 0.1	0.302
Three hours	0.1 ± 0.1	0.2 ± 0.1	0.64
Four hours	0.5 ± 0.1	0.6 ± 0.2	0.668
Five hours	0.9 ± 0.2	0.8 ± 0.2	0.685
Six hours	1.4 ± 0.3	0.9 ± 0.2	0.154
Nine hours	3.4 ± 0.3	1.2 ± 0.3	< 0.0001[b]
12 hours	3.9 ± 0.3	1.5 ± 0.3	< 0.0001[b]
24 hours	3.9 ± 0.3	1.0 ± 0.2	< 0.0001[b]

[a] Values are expressed as mean ± SE.
[b] The statistical test used was the *t*-test.

Open Access Full Text Article
ORIGINAL RESEARCH

Efficacy of Ketamine versus Magnesium Sulphate as Adjuvants to Levobupivacaine in Ultrasound Bilevel Erector Spinae Block in Breast Cancer Surgery (a Double-Blinded Randomized Controlled Study)

Fatma Adel El Sherif[1], Hamdy Abbas Youssef[2], Khaled Mohamed Fares[1], Sahar Abdel-Baky Mohamed[1], Ali Rabiee Ali[1], Ahmed M Thabet[2]

The median VASR and VASM scores did not differ between group C and groups M and K at any time point except for 36 h post-surgery ($p > 0.05$). Also, when comparing M to K group at any time point

We showed that groups K and M had significantly longer mean times for the first request of analgesia than group C. Moreover, total morphine consumption was significantly lower in the K and $MgSO_4$ groups than in the control group.

Magnesium sulphate and ketamine seem to be both effective adjuvants to levobupivacaine in ESP blocks for post-operative analgesia in patients undergoing MRM, with slightly better analgesia provided by magnesium

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ESRA ITALIA

Effect of Ketamine Added to Ropivacaine in Nerve Block for Postoperative Pain Management in Patients Undergoing Anterior Cruciate Ligament Reconstruction: a Randomized Trial

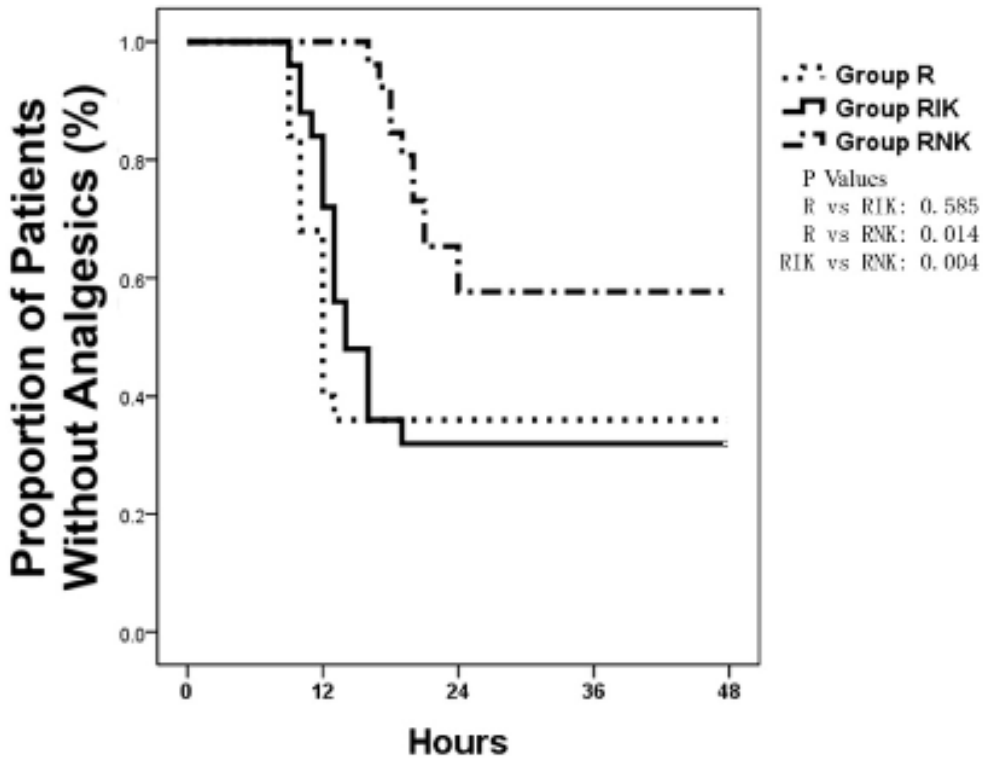

Table IV. Duration of blocks, postoperative analgesic consumption, and side effects. Values are given as mean (SD), median [interquartile ranges], or number of the patients.

Variable	Group R (n = 25)	Group RIK (n = 25)	Group RNK (n = 26)
Duration of motor block, min	357.6 (44.8)	368.4 (33.6)	367.7 (47.7)
Duration of sensory block, min	621.6 (56.3)	643.6 (62.2)	767.3 (69.4)*
Requiring rescue analgesic, no.	16	17	11*
Cumulative consumption of flurbiprofen axetil, mg	400 [300, 400]	400 [400, 500]	400 [300, 400]
Sleep disturbance at night 1, no.	6	14†	5
Consumption of sufentanil in PCIA			
Sufentanil 0–8 h, ug	12.4 (1.8)	12.2 (1.8)	13.1 (2.3)
Sufentanil 8–24 h, ug	35.3 (3.4)	34.2 (3.8)	26.4 (2.0)*
Satisfactory score	7.20 (0.4)	6.72 (0.5)‡	8.35 (0.7)*
Side effect, no.			
Shivering	0	1	1
Hallucination	0	8‡	1
Drowsiness	1	5	2
Pruritus	2	2	3
Postoperative nausea and vomiting	2	3	2
Fall	0	0	0

PCIA = patient controlled intravenous analgesia.
Group R received 40 mL of 0.375% ropivacaine; Group RNK received 40 mg of ketamine mixed with 0.375% ropivacaine in 40-mL volume; and Group RIK received 40-mL volume of 0.375% ropivacaine plus IV ketamine 40 mg.
*$P < 0.01$ indicates a significant difference, Group R compared with Group RIK.
†$P < 0.01$ indicates a significant difference, Group RNK compared with Group RIK.
‡$P < 0.05$ indicates a significant difference, compared with Group R.

Zhu T et all. Clin Ther. 2020

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