



**Dr Dwayne Möhr**  
**Specialist Anaesthetist**  
**LOCALIZING PAIN**







THE BEATINGS WILL  
CONTINUE



UNTIL MORALE IMPROVES

*Continued, Vol. II*





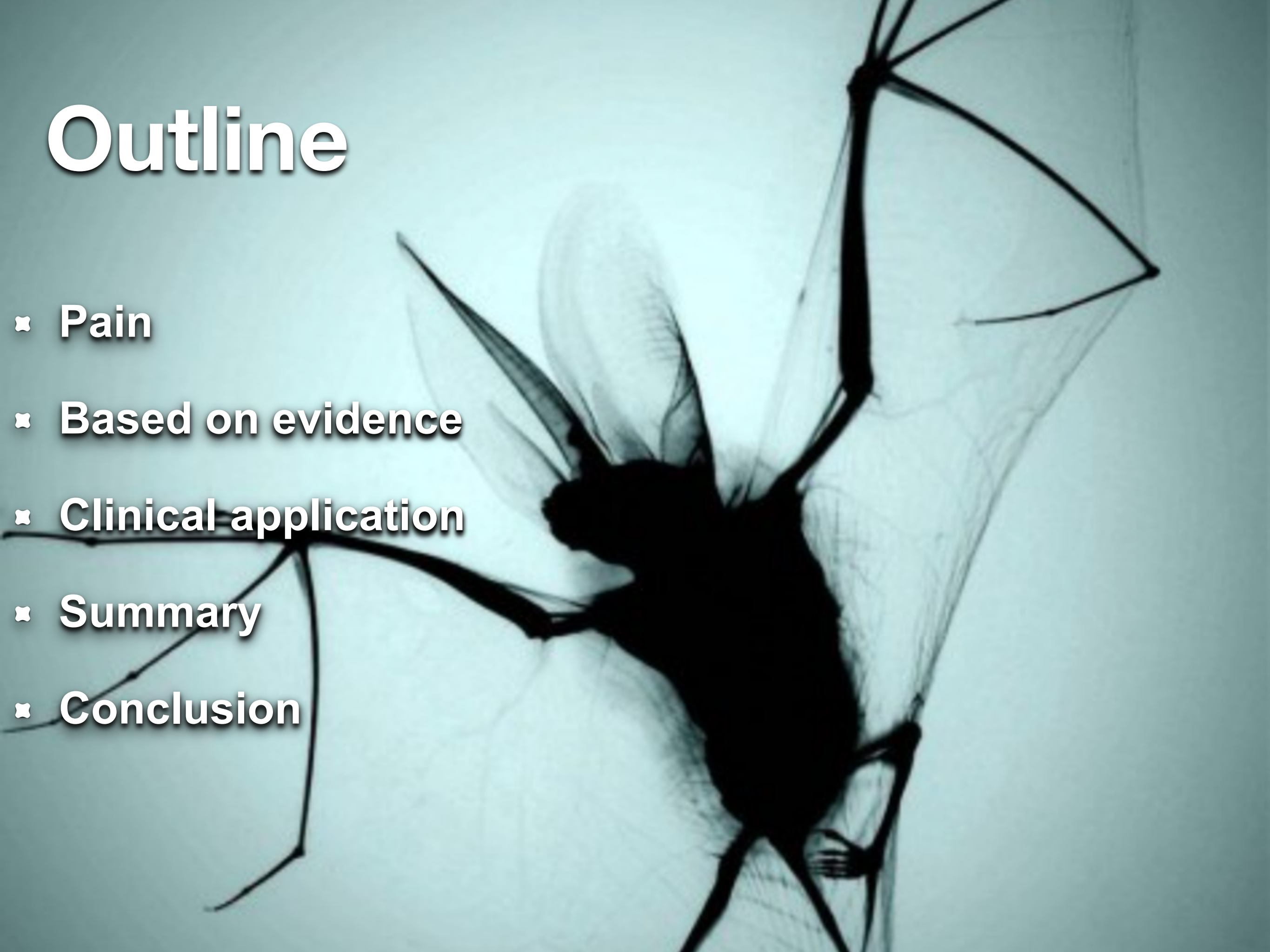






# Outline

- ✦ Pain
- ✦ Based on evidence
- ✦ Clinical application
- ✦ Summary
- ✦ Conclusion





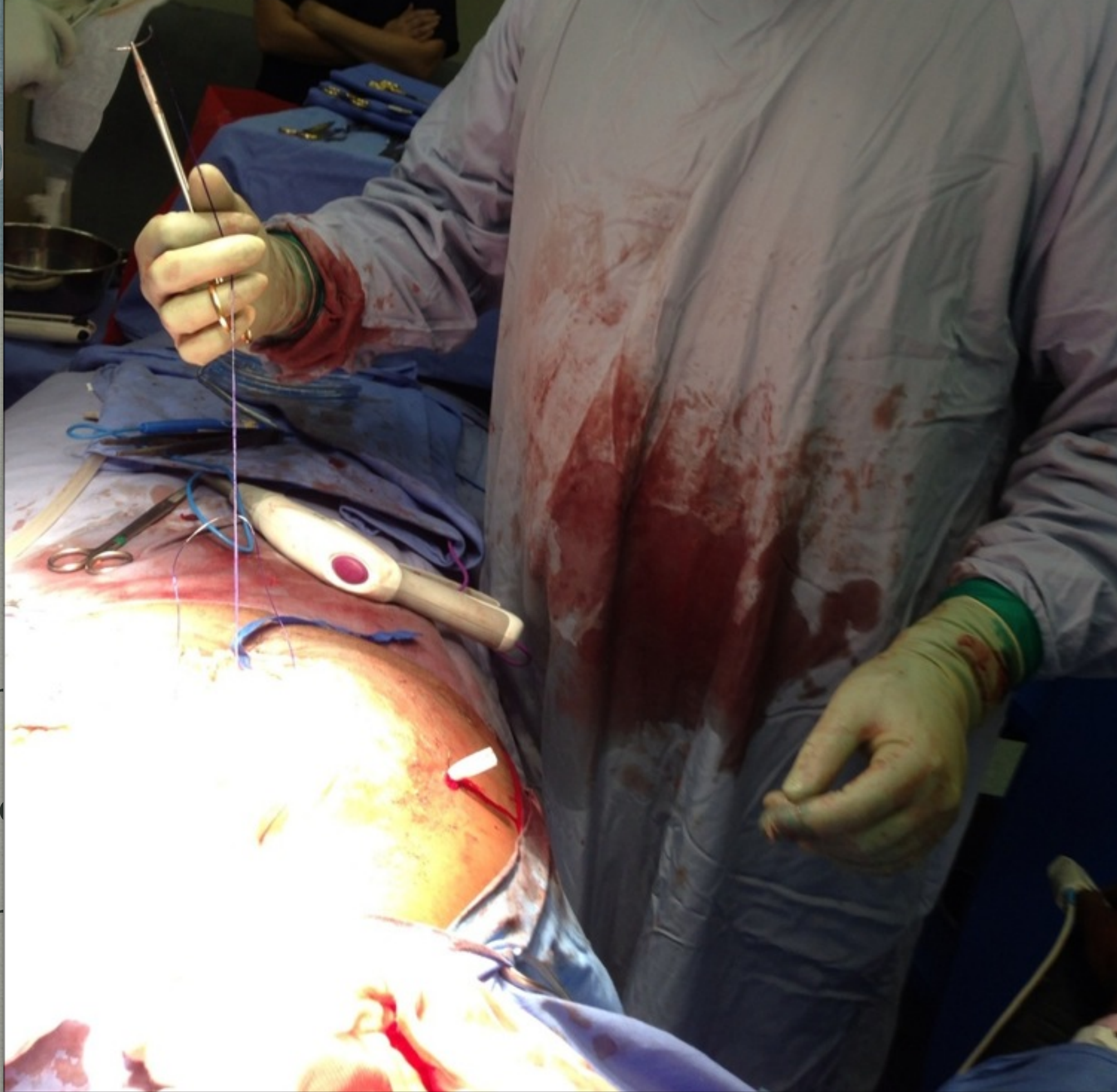
Yo

◆ “It’

◆ “Th

◆ “No

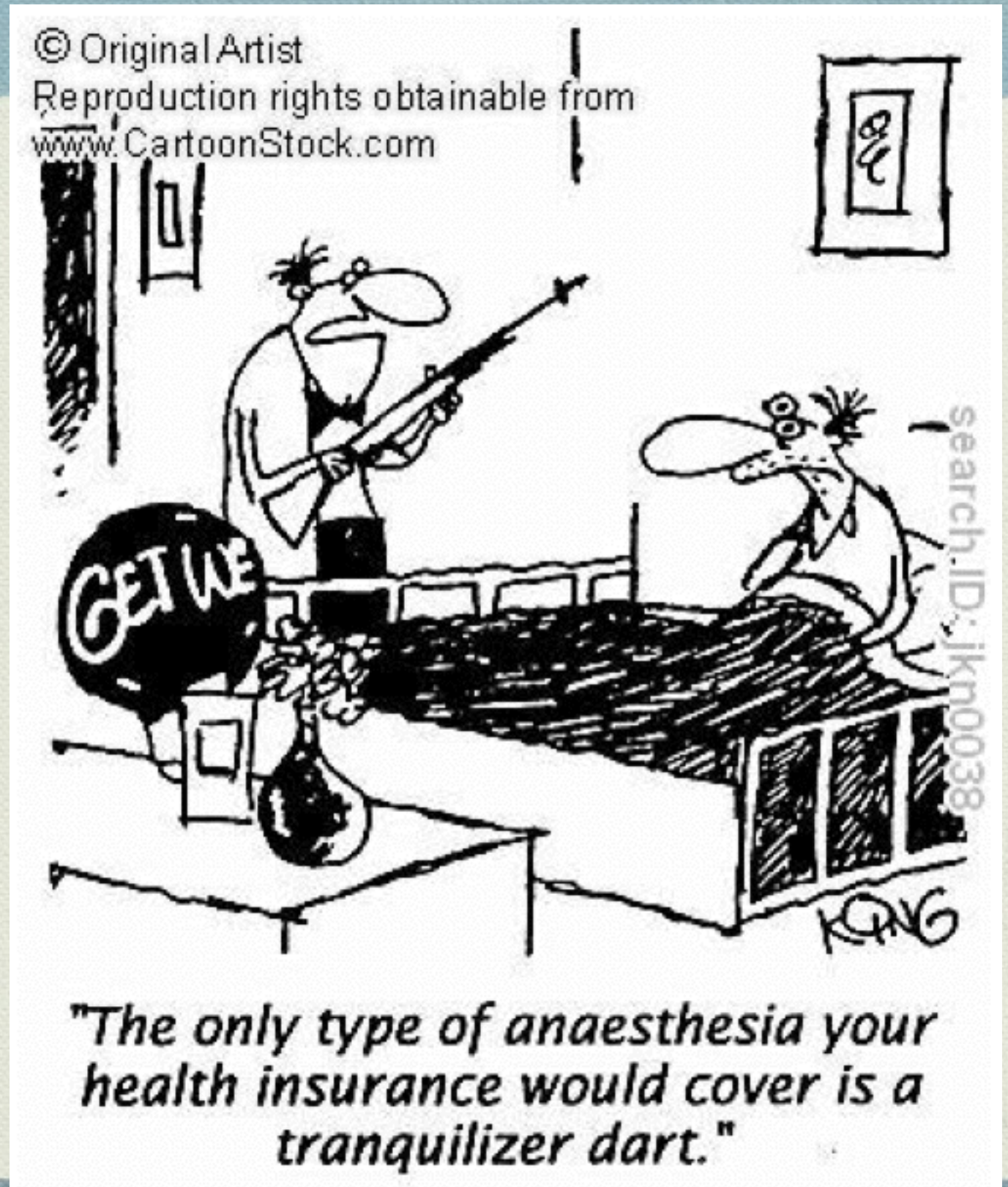
◆ “Th





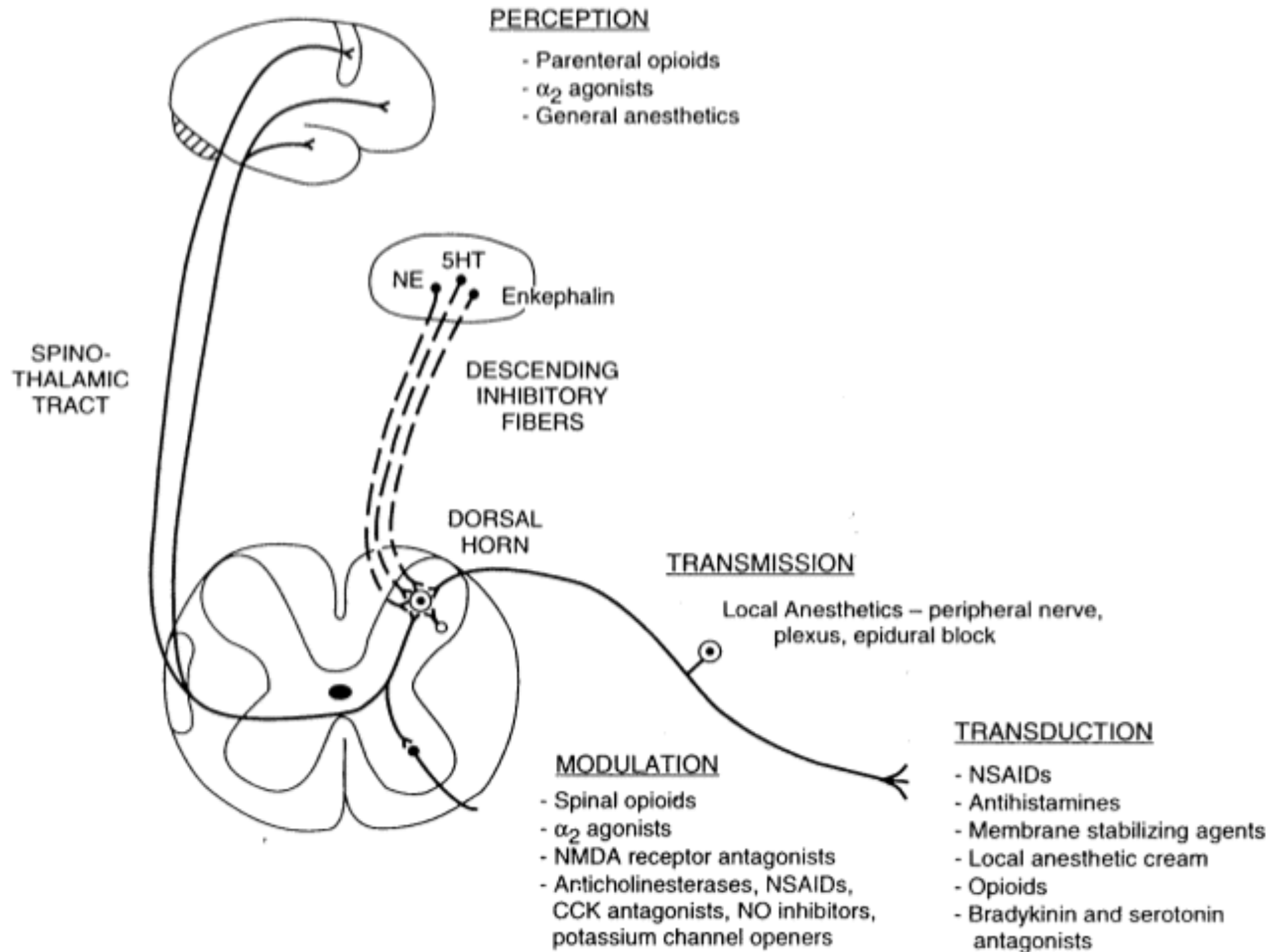
# Modern pain medicine

- ◆ Preemptive
- ◆ Preventative
- ◆ Multimodal
- ◆ Multidisciplinary
- ◆ Patient controlled





# Clinical pharmacology

















A red octagonal sign with a white border. The sign contains the text "ZERO" and "TOLERANCE" in white, bold, sans-serif capital letters, arranged in two lines.

**ZERO**  
**TOLERANCE**



every scar i  
have makes  
me who i am.





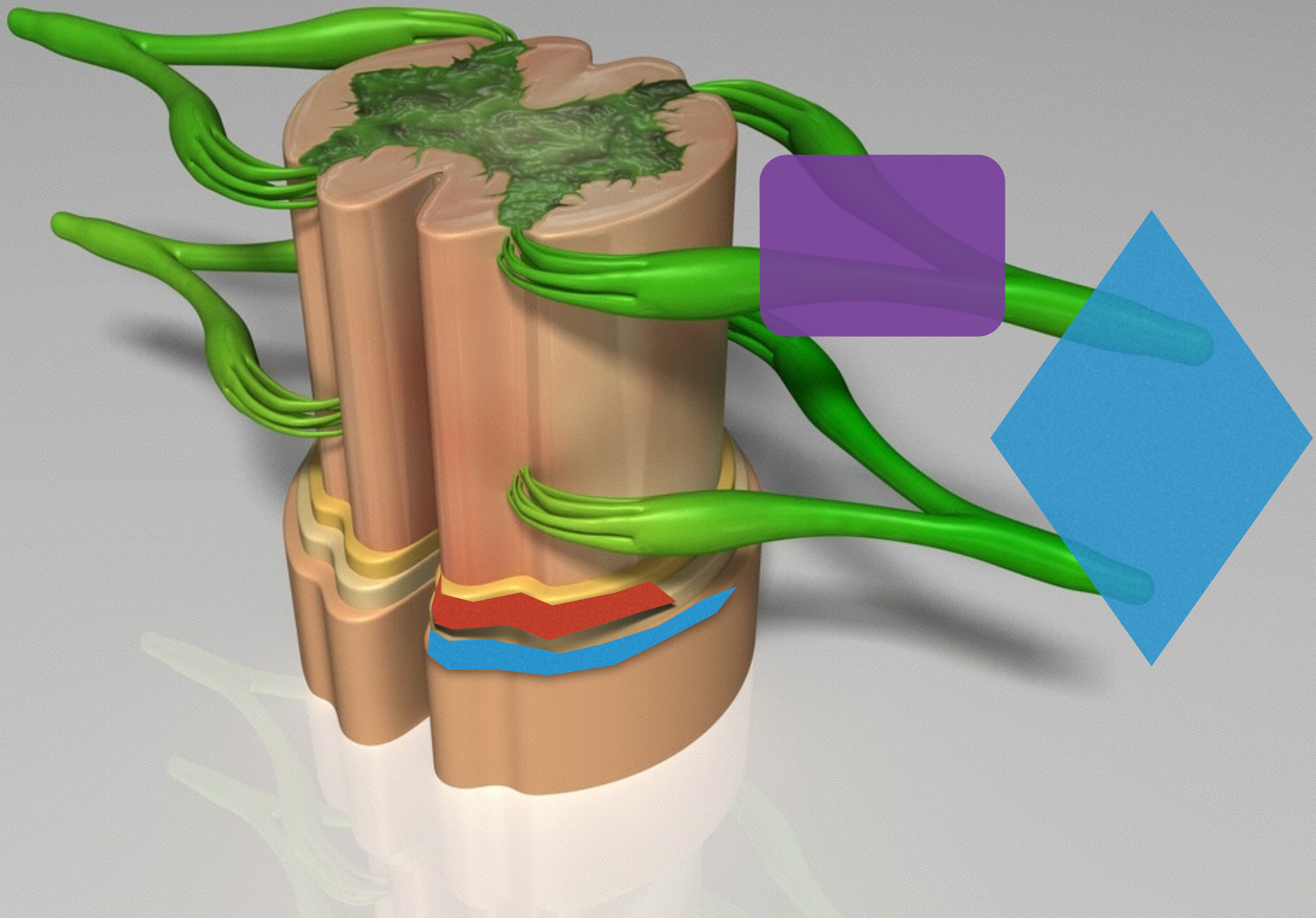


# What are the options?

- ◆ Regional analgesia
- ◆ NSAIDs and Paracetamol
- ◆ Opioids
- ◆ “Para-analgesics”
  - ◆ NMDA Receptor Antagonists
  - ◆  $\alpha 2$  Agonists
  - ◆ Miscellaneous









## REGIONAL ANAESTHESIA

### Laparoscopic cholecystectomy under segmental thoracic spinal anaesthesia: a feasibility study

A. A. J. van Zundert<sup>1\*</sup>, G. Stultiens<sup>2</sup>, J. J. Jakimowicz<sup>2</sup>, D. Peek<sup>1</sup>, W. G. J. M. van der Ham<sup>1</sup>,  
H. H. M. Korsten<sup>1</sup> and J. A. W. Wildsmith<sup>3</sup>

<sup>1</sup>Department of Anesthesiology, ICU and Pain Therapy and <sup>2</sup>Department of Surgery, Catharina Hospital–Brabant Medical School, Michelangelolaan 2, NL-5623 EJ Eindhoven, The Netherlands.

<sup>3</sup>Department of Anaesthesia, Ninewells Hospital and Medical School, Dundee DD1 9SY, UK

\*Corresponding author. E-mail: zundert@iae.nl

**Background.** Laparoscopic surgery is normally performed under general anaesthesia, but regional techniques have been found beneficial, usually in the management of patients with major medical problems. Encouraged by such experience, we performed a feasibility study of segmental spinal anaesthesia in healthy patients.

**Methods.** Twenty ASA I or II patients undergoing elective laparoscopic cholecystectomy received a segmental (T10 injection) spinal anaesthetic using 1 ml of bupivacaine 5 mg ml<sup>-1</sup> mixed with 0.5 ml of sufentanil 5 µg ml<sup>-1</sup>. Other drugs were only given (systemically) to manage patient anxiety, pain, nausea, hypotension, or pruritus during or after surgery. The patients were reviewed 3 days postoperatively by telephone.

**Results.** The spinal anaesthetic was performed easily in all patients, although one complained of paraesthesiae which responded to slight needle withdrawal. The block was effective for surgery in all 20 patients, six experiencing some discomfort which was readily treated with small doses of fentanyl, but none requiring conversion to general anaesthesia. Two patients required midazolam for anxiety and two ephedrine for hypotension. Recovery was uneventful and without sequelae, only three patients (all for surgical reasons) not being discharged home on the day of operation.

**Conclusions.** This preliminary study has shown that segmental spinal anaesthesia can be used successfully and effectively for laparoscopic surgery in healthy patients. However, the use of an anaesthetic technique involving needle insertion into the vertebral canal above the level of termination of the spinal cord requires great caution and should be restricted in application until much larger numbers of patients have been studied.

*Br J Anaesth* 2007; **98**: 682–6

**Keywords:** anaesthesia, day-case; anaesthetic techniques, regional, spinal; anaesthetics local, bupivacaine; analgesics opioid, sufentanil; surgery, laparoscopic cholecystectomy

Accepted for publication: January 24, 2007



## REVIEW ARTICLE

# Risks and side-effects of intrathecal morphine combined with spinal anaesthesia: a meta-analysis

M. Gehling<sup>1</sup> and M. Tryba<sup>2</sup>

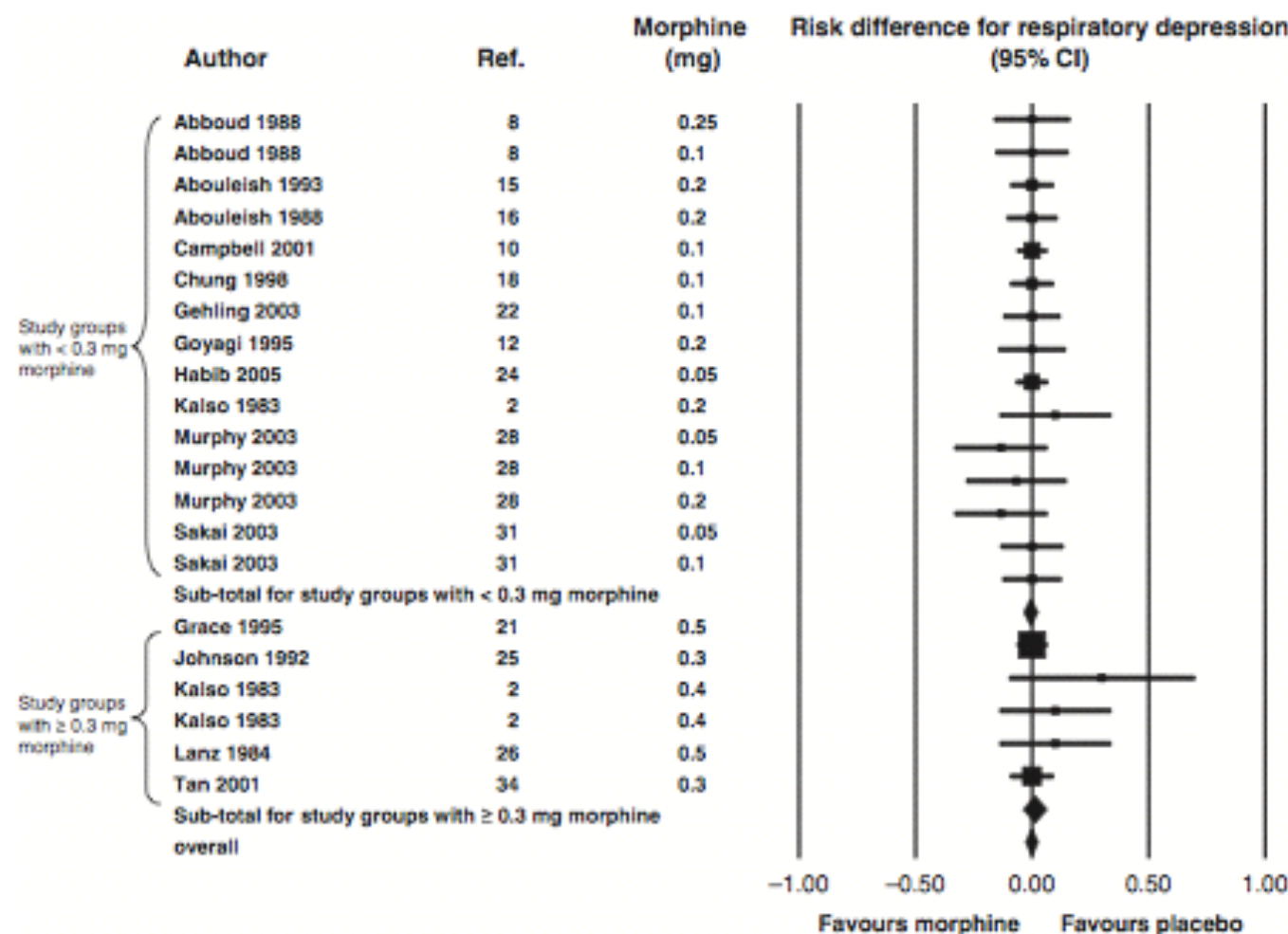
*1 Consultant Anaesthetist and 2 Head of Department, Department of Anaesthesiology, Intensive Care Medicine and Pain Therapy, Klinikum Kassel, Kassel, Germany*

### Summary

Intrathecal morphine is often used for postoperative analgesia after surgery. We performed a meta-analysis to obtain more detailed information on the frequency of side-effects in patients


M. Gehling and M. Tryba • Side-effects of intrathecal morphine

Anaesthesia, 2009, **64**, pages 643–651

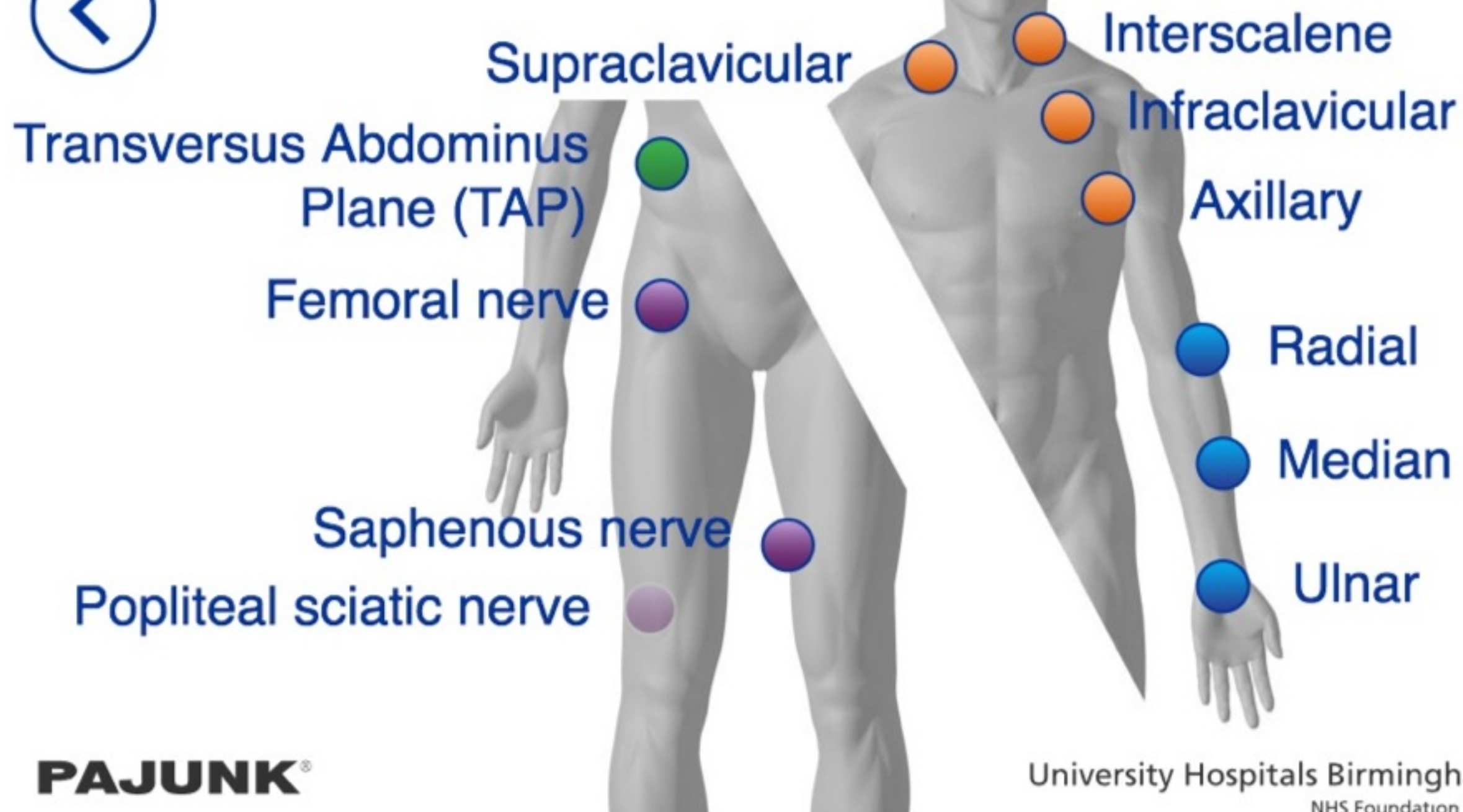


**Figure 6** Risk of respiratory depression after intrathecal morphine.

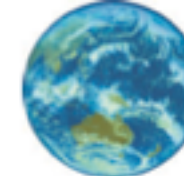


- 
- **Superior analgesia**
  - **Normal physiology**
  - **Adjunctive outcomes**
  - **High risk patients**
  - **Overall mortality**









## Pre-emptive intraperitoneal local anaesthesia: an effective method in immediate post-operative pain management and metabolic stress response in laparoscopic appendicectomy, a randomized, double-blinded, placebo-controlled study

Mohana Raj Thanapal,\*¶ Mahadevan D. Tata,\* Ann J. Tan,† Thiruselvi Subramaniam,† Jenny M. G. Tong,† Kandasami Palayan,‡ Sanjay Rampal§ and Ramesh Gurunathan\*

\*Department of Surgery, Tuanku Ja'afar Hospital, Seremban, Negeri Sembilan, Malaysia

†Department of Anesthesiology, Tuanku Ja'afar Hospital, Seremban, Negeri Sembilan, Malaysia

‡Department of Surgery, International Medical University, Kuala Lumpur, Malaysia

§Department of Social and Preventive Medicine, Faculty of Medicine, University of Malaya, Kuala Lumpur, Malaysia and

¶Department of Surgery, University of Malaya Medical Centre, Kuala Lumpur, Malaysia

### Key words

intraperitoneal local anaesthesia, metabolic stress response, pre-emptive analgesia.

### Correspondence

Dr Mohana Raj Thanapal, Department of Surgery, Tuanku Ja'afar Hospital, Seremban, Negeri Sembilan 70300, Malaysia. Email: mohan301979@gmail.com

**M. R. Thanapal** MD (USM), MSurg (UM), MRCS (Ire);  
**M. D. Tata** MBBS (Mal), MSurg (Mal); **A. J. Tan** MBBS (IMU), MAnaes (UM); **T. Subramaniam** MBBS (Ind), MMed (Anaes) (S'pore), MMed (Mal); **J. M. G. Tong** MBBS (UM), MAnaes (UM); **K. Palayan** MBBS (BOM), FRCS (Edin), FRCS (Glas), FRCS (Ire), FAMM (Mal);  
**S. Rampal** MBBS (Bangalore), MPH (Harvard);  
**R. Gurunathan** MBBS, MS, FRCS (Ire).

Accepted for publication 8 April 2012.

doi: 10.1111/j.1445-2197.2012.06210.x

### Abstract

**Background:** Although laparoscopic surgeries are associated with reduced surgical stress response and shortened post-operative recovery, intense pain and high analgesia requirements in the immediate post-operative period are often the chief complaints.

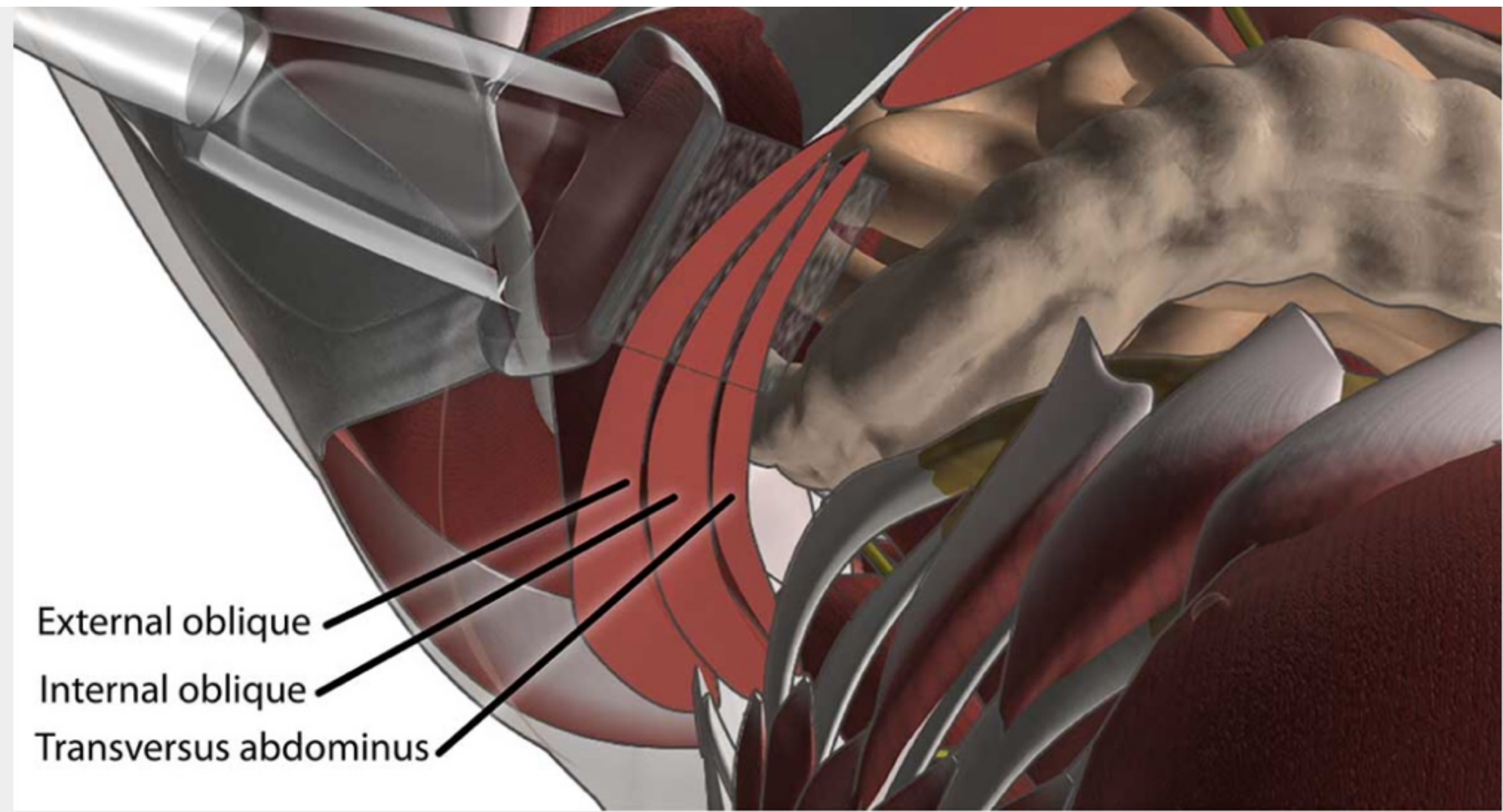
**Aim:** The aim of this study was to evaluate the effect of pre-emptive intraperitoneal local anaesthetic drugs on post-operative pain management and metabolic stress response in laparoscopic appendicectomy.

**Method:** The method used was a randomized double-blinded placebo-controlled study. Patients with clinical diagnosis of acute appendicitis who fulfil the criteria, were taken into this study. Primary outcomes investigated were consumption of patient-controlled analgesia during the immediate post-operative period (first 6 h) and subsequent 18 h as well as serum cortisol sampling.

**Results:** Total of 120 patients were recruited into three different treatment groups (placebo, ropivacaine, levobupivacaine). In order to maintain visual analogue score of 0–1 during the immediate post-operative period, patients in the placebo group required significantly ( $P < 0.001$ ) higher dose of analgesia (morphine/mg) – 11 mg (8.3–15.5) as compared with ropivacaine – 4 mg (3.0–6.0) and levobupivacaine – 3.5 mg (2.0–5.0). The immediate post-operative serum cortisol showed a significant increase in serum cortisol in the placebo group ( $P = 0.001$ ) as compared with ropivacaine and levobupivacaine groups.

**Conclusion:** Pre-emptive intraperitoneal local anaesthesia in laparoscopy surgery is a safe, non-invasive procedure that can benefit patients by reducing the immediate post-operative pain intensity and metabolic stress response of the body.





External oblique

Internal oblique

Transversus abdominus



# Clinical effectiveness of transversus abdominis plane (TAP) block in abdominal surgery: a systematic review and meta-analysis

N. Johns<sup>\*†</sup>, S. O'Neill<sup>\*†</sup>, N. T. Ventham<sup>\*</sup>, F. Barron<sup>‡</sup>, R. R. Brady<sup>\*</sup> and T. Daniel<sup>\*</sup>

<sup>\*</sup>Department of Surgery, Victoria Hospital, Kirkcaldy, UK, <sup>†</sup>Department of Clinical Surgery, University of Edinburgh, Edinburgh, UK and <sup>‡</sup>Department of Anaesthetics, Victoria Hospital, Kirkcaldy, UK

Received 1 February 2012; accepted 10 April 2012; Accepted Article online 25 May 2012

## Abstract

**Aim** Reduced opioid use in the immediate postoperative period is associated with decreased complications. This study aimed to determine the effect of transversus abdominis plane (TAP) block on morphine requirements 24 h after abdominal surgery. Secondary outcomes included the effect of TAP block on morphine use 48 h after surgery, incidence of postoperative nausea and vomiting (PONV) and impact on reported pain scores (visual analogue scale).

**Method** A systematic review of the literature was conducted for randomised controlled trials (RCTs) evaluating the effects of TAP block in adults undergoing abdominal surgery. For continuous data, weighted mean differences (WMD) were formulated; for dichotomous data, odds ratios (OR) were calculated. Results were produced with a random effects model with 95% confidence intervals (CI).

**Results** Nine studies, including published and unpublished data, containing a total of 413 patients were included. Of these 205 received a TAP block and 208 a placebo. Cumulative morphine utilization was statistically significantly reduced at 24 h [WMD = 23.71 mg (38.66–8.76);  $P = 0.002$ ] and 48 h [WMD = 38.08 mg (18.97–57.19);  $P < 0.0001$ ] in patients who received a TAP block and the incidence of PONV was significantly

reduced [OR = 0.41(0.22–0.74);  $P = 0.003$ ]. There was a nonsignificant reduction in the visual analogue postoperative pain [WMD = 0.73 cm (1.8  $P = 0.2$ ). There were no reported adverse events with TAP block.

**Conclusion** Transversus abdominis plane block reduces postoperative morphine requirements and vomiting and possibly the severity of pain after abdominal surgery. It should be considered as a multimodal approach to anaesthesia and analgesia in patients undergoing abdominal surgery.

**Keywords** Transversus abdominis plane block, local anaesthetic, opioid, field block, nausea and vomiting

## What is new in this paper?

This systematic review and meta-analysis of randomized controlled trials compares patients who received a transversus abdominis plane (TAP) block in abdominal surgery with those who did not. TAP block significantly reduced morphine requirement within the first 24 and 48 h postoperatively. This is the first meta-analysis to show a reduction in the incidence of postoperative nausea and vomiting with using TAP blocks.

anaesthesia techniques, and particularly abdominal field blocks, have long been recognized as an analgesic strategy that may be used to control postoperative wound pain [4].

The transversus abdominis plane (TAP) local anesthetic block is an analgesic technique that has increasingly become popular over the last decade and involves infiltration of local anaesthetic in the plane between the internal oblique and transversus abdominis muscles. Sensory afferent nerve branches of the lower six and upper lumbar nerves innervate the anterior

Hernia (2013) 17:749–755  
DOI 10.1007/s10029-012-1022-2

## ORIGINAL ARTICLE

# Outpatient inguinal hernia repair under local anaesthesia: feasibility and efficacy of ultrasound-guided transversus abdominis plane block

M. Milone · M. N. D. Di Minno · M. Musella · P. Maletta · G. Salvatore · C. Iacovazzo · F. Milone

Received: 28 May 2012 / Accepted: 5 November 2012 / Published online: 16 November 2012  
© Springer-Verlag France 2012

## Abstract

**Background** The aim of this prospective randomized study was to determine the utility of transversus abdominis plane (TAP) block to improve the efficacy of conventional local anaesthesia for hernia repair in order to achieve an adequate anaesthesia and to evaluate its post-operative analgesic effectiveness.

**Method** Hundred and fifty consecutive male patients undergoing outpatient hernia repair (Lichtenstein technique) were enrolled in this study. Patients were randomly allocated to undergo a combined TAP block and local anaesthesia (case group) or single conventional local anaesthesia (control group). The study was designed to obtain a 1:2 case–control ratio. The primary outcome was the evaluation of the proportion of patients achieving an adequate anaesthesia. The secondary outcome was the evaluation of pain on movement, pain at rest, rescue analgesia need, nausea and satisfaction.

**Results** An adequate anaesthesia was achieved in 8 % case and in 36 % control subjects ( $p = 0.001$ ). At the 6 and 12 h post-operative evaluations, patients enrolled in the case group reported significantly less pain (evaluated by VAS score) both at rest and on movement ( $p$  always = 0.001). Moreover, the need of rescue analgesia resulted significantly higher in the control group (14 vs. 32 %,  $p = 0.01$ ).

**Conclusion** Our results demonstrated that, as compared with conventional local anaesthesia, the combination of TAP block with local anaesthesia showed a higher efficacy

in the obtainment of an adequate anaesthesia and in the post-operative pain control for hernia repair.

**Keywords** TAP block · Hernia · Anaesthesia · Analgesia

## Introduction

Inguinal hernia repair is one of the most commonly performed operations world-wide [1]. However, there is no common consensus among surgeons regarding the best choice of anaesthesia.

Several retrospective and randomized controlled trials demonstrated the clinical and pharmacoeconomic superiority of local anaesthesia as compared with spinal and general anaesthesia [2–6]. In spite of this, the use of local anaesthesia for inguinal hernia repair in Europe is not a common practice. Interestingly, the low utilization of local anaesthesia for inguinal hernia repair was noticed across Europe. Previous studies have revealed that, in the UK, only 5–10 % of inguinal hernias undergo surgery under local anaesthesia with the majority of cases being repaired under general (60–70 %) or regional anaesthesia (10–20 %) [7–11].

The transversus abdominis plane (TAP) block is a regional anaesthesia technique that provides analgesia to the parietal peritoneum as well as to the skin and muscles of the anterior abdominal wall [12, 13]. Despite a relatively low risk of complications and a high success rate using modern techniques, TAP block remains overwhelmingly underutilized. Although the block is technically straightforward, there is inertia regarding its adoption into clinical practice [12].

The aim of this prospective randomized study was to determine the utility of TAP block to improve the efficacy

Correspondence to: Thomas Daniel, Department of Surgery, Victoria Hospital, Hayfield Road, Kirkcaldy, Fife KY2 5AH, UK.  
E-mail: thomasdaniel@nhs.net



# Transversus Abdominis Plane Block to Ameliorate Postoperative Pain Outcomes After Laparoscopic Surgery: A Meta-Analysis of Randomized Controlled Trials

Gildasio S. De Oliveira Jr, MD, MSCI, Lucas Jorge Castro-Alves, MD, Autoun Nader, MD, Mark C. Kendall, MD, and Robert J. McCarthy, PharmD

**BACKGROUND:** Transversus abdominis plane (TAP) block has been used as a multimodal strategy to optimize postoperative pain outcomes; however, it remains unclear which type of surgical procedures can benefit from the administration of a TAP block. Several studies have examined the effect of the TAP block on postoperative pain outcomes after laparoscopic surgical procedures and generated conflicting results. Our main objective in the current investigation was to evaluate the effect of TAP block on postoperative analgesia outcomes for laparoscopic surgical procedures.

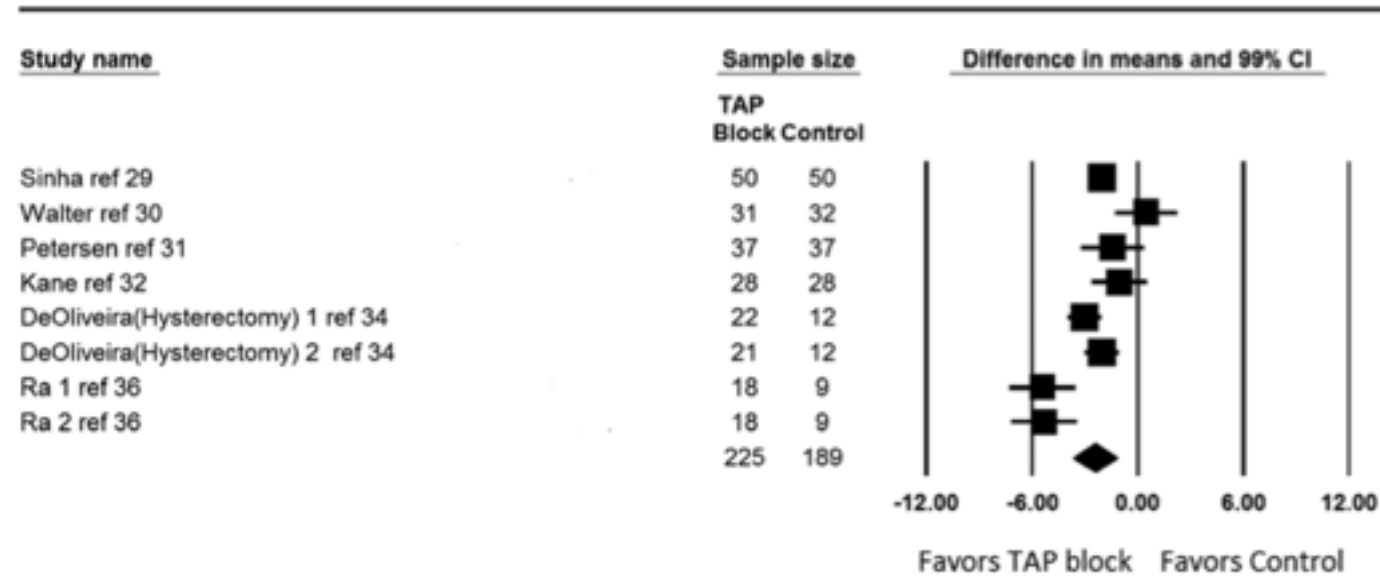
**METHODS:** A search was performed to identify randomized controlled trials that evaluated the effects of the TAP block compared with an inactive group (placebo or “no treatment”) on postoperative pain outcomes in laparoscopic surgical procedures. Primary outcomes included early (0–4 hours) and late (24 hours) postoperative pain at rest and on movement and postoperative opioid consumption (up to 24 hours). Meta-analysis was performed using a random-effects model. Publication bias was evaluated by examining the presence of asymmetric funnel plots using Egger regression test. Meta-regression analysis was performed to establish an association between the local anesthetic dose and the evaluated outcomes.

**RESULTS:** Ten randomized clinical trials with 633 subjects were included in the analysis. The weighted mean difference (99% confidence interval) of the combined effects favored TAP block over control for pain at rest ( $\leq 4$  hours,  $-2.41$  [ $-3.6$  to  $-1.16$ ]) and (at 24 hours,  $-1.33$  [ $-2.19$  to  $-0.48$ ]) (0–10 numerical scale). Postoperative opioid consumption was decreased in the TAP block group compared with control, weighted mean difference (99% confidence interval) of  $-5.74$  ( $-8.48$  to  $-2.99$ ) mg morphine IV equivalents. Publication bias was not present in any of the analysis. Preoperative TAP block administration resulted in greater effects on early pain and opioid consumption compared with postoperative administration. Meta-regression analysis revealed an association between local anesthetic dose and the TAP block effect on late pain at rest and postoperative opioid consumption. None of the studies reported symptoms of local anesthetic toxicity.

**CONCLUSIONS:** TAP block is an effective strategy to improve early and late pain at rest and to reduce opioid consumption after laparoscopic surgical procedures. In contrast, the TAP block was not superior compared with control to reduce early and late pain during movement. Preoperative administration of a TAP block seems to result in greater effects on postoperative pain outcomes. We also detected a local anesthetic dose response on late pain and postoperative opioid consumption. (Anesth Analg 2014;118:454–63)

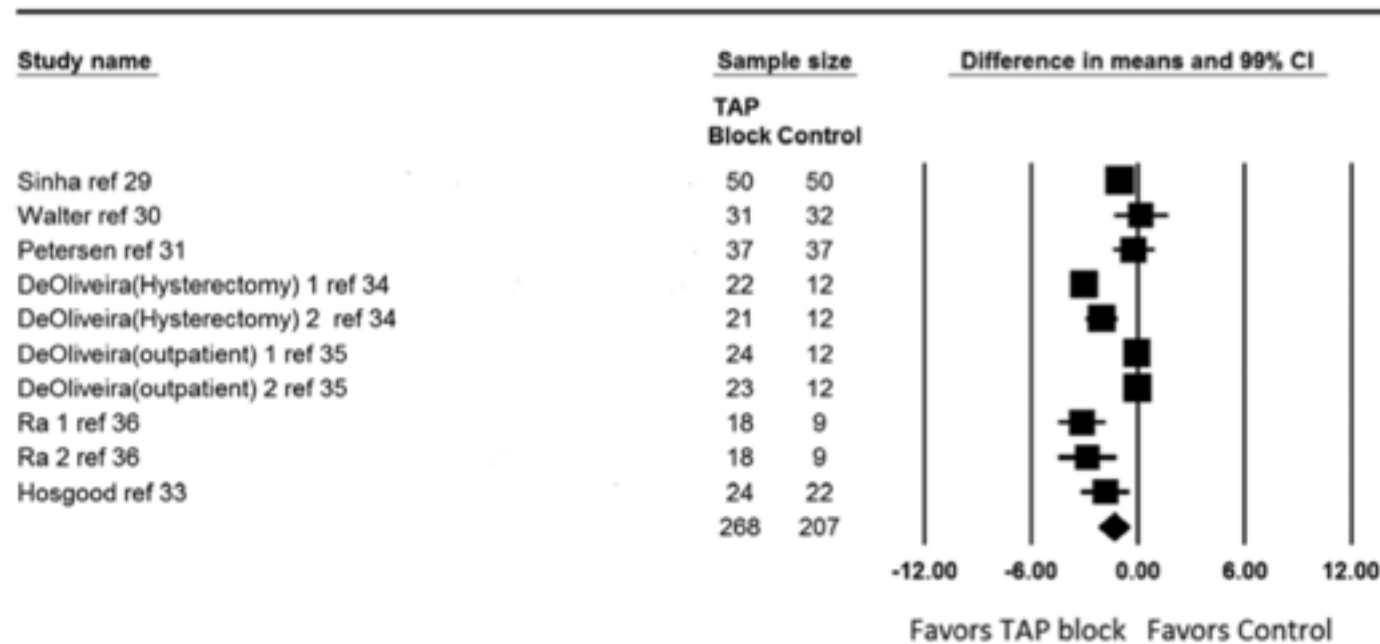


## Early Pain at Rest



**Figure 2.** Meta-analysis evaluating the effect of transversus abdominis plane (TAP) block on early pain scores ( $\leq 4$  hours) at rest compared with control. The overall effect of TAP block versus control was estimated as a random effect. Point estimate (99% confidence interval [CI]) for overall effect was  $-2.41$  ( $-3.6$  to  $-1.16$ ) (0–10 numerical scale). Weighted mean difference for individual studies represented by square on Forrest plot, with 99% CI of the difference shown as solid line. Larger sized square and thicker 99% CI line denote larger sample size. The diamond represents the pooled estimate and uncertainty for the effects of TAP block compared with control.

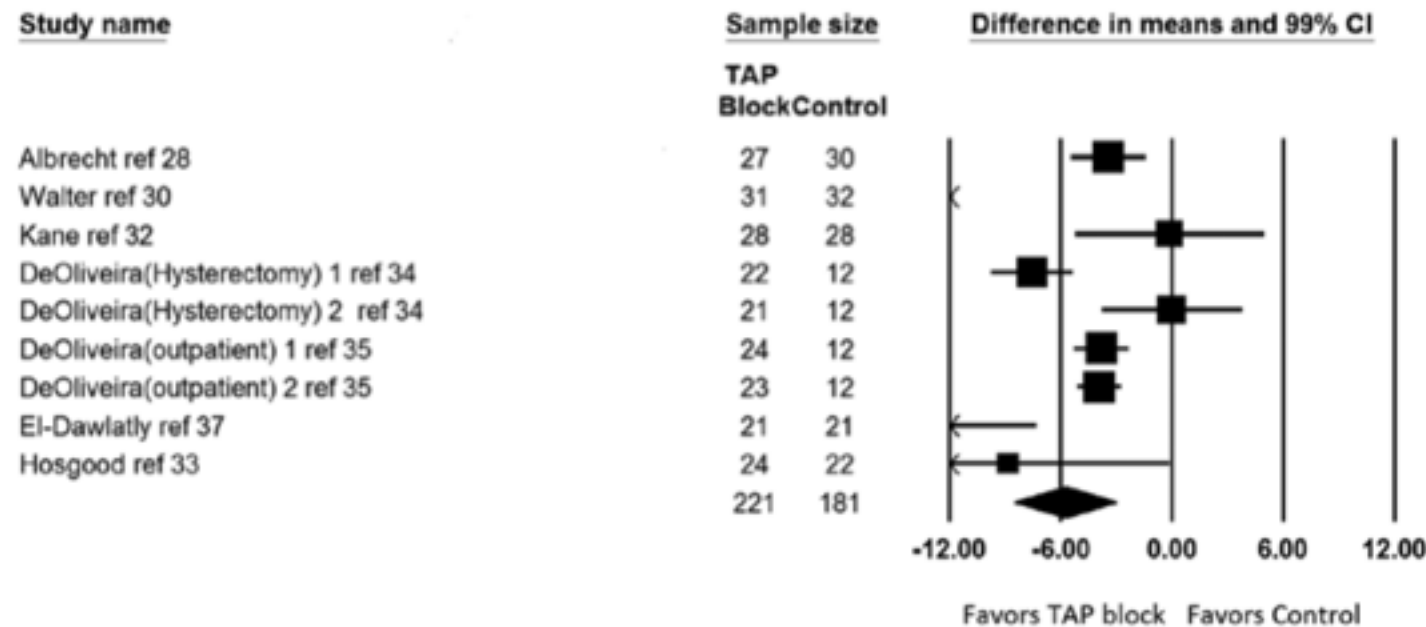
## Late Pain at Rest



**Figure 3.** Meta-analysis evaluating the effect of transversus abdominis plane (TAP) block on late pain scores (24 hours) at rest compared with control. The overall effect of TAP block versus control was estimated as a random effect. Point estimate (99% confidence interval [CI]) for overall effect was  $-1.33$  ( $-2.19$  to  $-0.48$ ) (0–10 numerical scale). Weighted mean difference for individual studies represented by square on Forrest plot, with 99% CI of the difference shown as solid line. Larger sized square and thicker 99% CI line denote larger sample size. The diamond represents the pooled estimate and uncertainty for the effects of TAP block compared with control.



## Opioid Consumption



**Figure 5.** Meta-analysis evaluating the effect of transversus abdominis plane (TAP) block on postoperative opioid consumption compared with control. The overall effect of TAP block versus control was estimated as a random effect. Point estimate (99% confidence interval) for overall effect was  $-5.74$  ( $-8.48$  to  $-2.99$ ) mg morphine IV equivalents. Weighted mean difference for individual studies represented by square on Forrest plot, with 99% CI of the difference shown as solid line. Larger sized square and thicker 99% CI line denote larger sample size. The diamond represents the pooled estimate and uncertainty for the effects of TAP block compared with control.

an association between the total local anesthetic volume administered (milliliters) and an effect on late pain at rest (slope [95% CI] =  $-0.02$  [ $-0.045$  to  $-0.006$ ],  $P < 0.001$  compared with slope = 0).

### Late Pain (24 Hours) at Movement

The overall effect of 3 studies<sup>28,30,31</sup> that examined the effect of TAP block on late pain at movement compared with control did not reveal a significant effect in relation to a large CI, WMD (99% CI) of  $0.33$  ( $-0.40$  to  $1.07$ ) (0–10 numerical scale),  $P = 0.31$ . Heterogeneity was low ( $I^2 = 0$ ). All the studies evaluated TAP block performed preoperatively.

### Postoperative Opioid Consumption (up to 24 Hours)

The aggregated effect of 7 studies (9 comparisons)<sup>28,30,32–35,37</sup> evaluating the effect of TAP block on postoperative opioid consumption compared with control favored TAP block, WMD (99% CI) of  $-5.74$  ( $-8.48$  to  $-2.99$ ) mg IV morphine,  $P < 0.001$  (Fig. 5). Two studies provided 2 comparison, and they were included in the analysis.<sup>34,35</sup> The funnel plot did not demonstrate asymmetry ( $P = 0.12$ ). Heterogeneity was

high ( $I^2 = 89\%$ ). The aggregated effect of studies evaluating TAP block performed preoperatively was substantially greater, WMD (95% CI) of  $-6.34$  ( $-8.52$  to  $-4.15$ ) compared with the effect of the only study that evaluated TAP block performed postoperatively, WMD (95% CI) of  $-0.1$  ( $-5.16$  to  $4.96$ ),  $P = 0.03$ . A meta-regression analysis suggested an association between the total local anesthetic dose administered and an effect on postoperative opioid consumption (slope [95% CI] =  $-0.02$  [ $-0.03$  to  $-0.007$ ],  $P = 0.003$  compared with slope = 0; Fig. 6).

### Time to First Analgesic Administration (Minutes)

The only study evaluating TAP block on time to first analgesic administration demonstrated an effect compared with control, WMD (95% CI) of  $27.0$  ( $15.4$ – $38.5$ ) minutes,  $P < 0.001$ .<sup>28</sup> This was a high-quality study (Jadad = 5) and evaluated TAP block performed preoperatively.

### Safety Analysis

#### Local Anesthetic Toxicity

None of the included studies reported on clinical manifestations of local anesthetic toxicity.



## Ultrasonography guided rectus sheath catheters versus epidural analgesia for open colorectal cancer surgery in a single centre

AR Godden, MJ Marshall, AS Grice, IR Daniels

Royal Devon and Exeter Hospital NHS Foundation Trust, UK

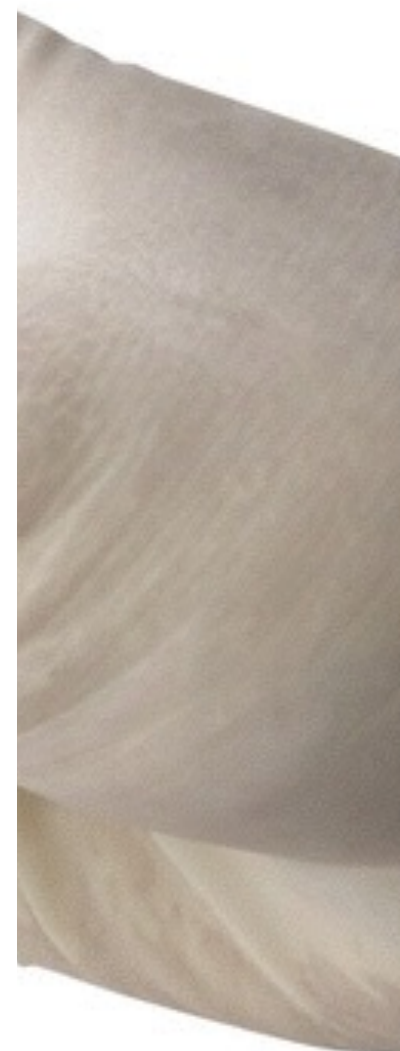
### ABSTRACT

**INTRODUCTION** Epidural anaesthesia (EA) has been the accepted standard for postoperative analgesia in open abdominal surgery. However, it is not without significant risk. This study aimed to audit the effect of EA and ultrasonography placed rectus sheath catheters (RSCs) on analgesia as well as the incidence of postoperative complications following open colorectal cancer surgery.

**METHODS** A three-year retrospective case note review was undertaken of all patients undergoing open colorectal cancer surgery at the Royal Devon and Exeter Hospital NHS Foundation Trust who received either EA or RSC for postoperative analgesia under the care of the senior authors. A single surgeon and single anaesthetist were practitioners.

**RESULTS** The case notes of 120 patients were reviewed retrospectively: 85 patients had EA and 24 RSC while 11 patients were excluded from the study. The EA group experienced a significantly higher incidence of hypotension (systolic blood pressure <130mmHg) than the RSC group on the first postoperative day ( $p=0.0001$ ). There was no significant difference in pain score or opiate sparing properties between the groups ( $p=0.92$ ). There was no significant difference in postoperative respiratory tract infection, anastomotic leak or wound complications between the groups ( $p=0.2$ ,  $p=1.0$  and  $p=0.5$  respectively). The RSC group had a higher incidence of ileus than the EA group (4/24 vs 2/85,  $p=0.026$ ). However, the numbers were too small to draw a reliable conclusion.

**CONCLUSIONS** The use of ultrasonography guided RSCs has demonstrated effective postoperative analgesia equivalent to EA with the potential benefits of a reduced incidence of hypotension. A prospective randomised trial is now underway to compare RSC and EA in open abdominal and pelvic surgery.





# Ultrasound Guidance Reduces the Risk of Local Anesthetic Systemic Toxicity Following Peripheral Nerve Blockade

Michael J. Barrington, PhD, MBBS, FANZCA and Roman Kluger, MBBS, FANZCA, PhD<sup>1</sup>

**Background and Objectives:** Local anesthetic systemic toxicity (LAST) is a potentially life-threatening complication of local anesthetic administration. In this article, the results of the Australian and New Zealand Registry of Regional Anaesthesia were analyzed to determine if ultrasound-guided peripheral nerve blockade (PNB) was associated with a reduced risk of LAST compared with techniques not utilizing ultrasound technology.

**Methods:** The period of study for this multicenter study involving 20 hospitals was from January 2007 through May 2012. The primary outcome was LAST comprising minor, major, and cardiac arrest (due to toxicity) events determined using standardized definitions. Multivariable logistic regression models and propensity score analyses were used to determine significant event predictors.

**Results:** The study population comprised 20,021 patients who received 25,336 PNBs. There were 22 episodes of LAST, resulting in an incidence of LAST of 0.87 per 1000 PNBs (95% confidence interval, 0.54–1.3 per 1000). Ultrasound guidance was associated with a reduced incidence of local anesthetic toxicity. Site of injection, local anesthetic type, dose per weight, dose, and patient weight were all predictors of LAST.

**Conclusions:** This study provides the strongest evidence, to date, that ultrasound guidance may improve safety because it is associated with a reduced risk of LAST following PNB.

(*Reg Anesth Pain Med* 2013;38: 289–299)

Ultrasound-guided PNB is associated with a reduced incidence of inadvertent vascular puncture<sup>1,2</sup> and reduced local anesthetic requirements compared with conventional techniques.<sup>7</sup> Therefore, there exist plausible mechanisms by which ultrasound-guided PNB reducing the incidence of LAST may be either inadvertent intravenous injection or delayed absorption of a tissue depot of local anesthetic. However, factors unrelated to ultrasound imaging such as the site of injection, patient comorbidities, and other practice patterns may contribute to LAST.

In this article, we analyze results of the Australian and New Zealand Registry of Regional Anaesthesia (AURORA). The project was formerly known as the Australian Regional Anaesthesia Collaboration<sup>5</sup> and is a prospective multicenter clinical registry that monitors and reports on the quality and safety of contemporary PNB. AURORA utilizes a Web-based interface to a remote database, allowing collection of clinical information on many PNBs. The primary objective of this analysis was to ascertain if ultrasound-guided PNB was associated with a reduced incidence of LAST compared with PNB techniques that do not use ultrasound.

## METHODS

The institutional review board of all hospitals contributing to AURORA approved this study.









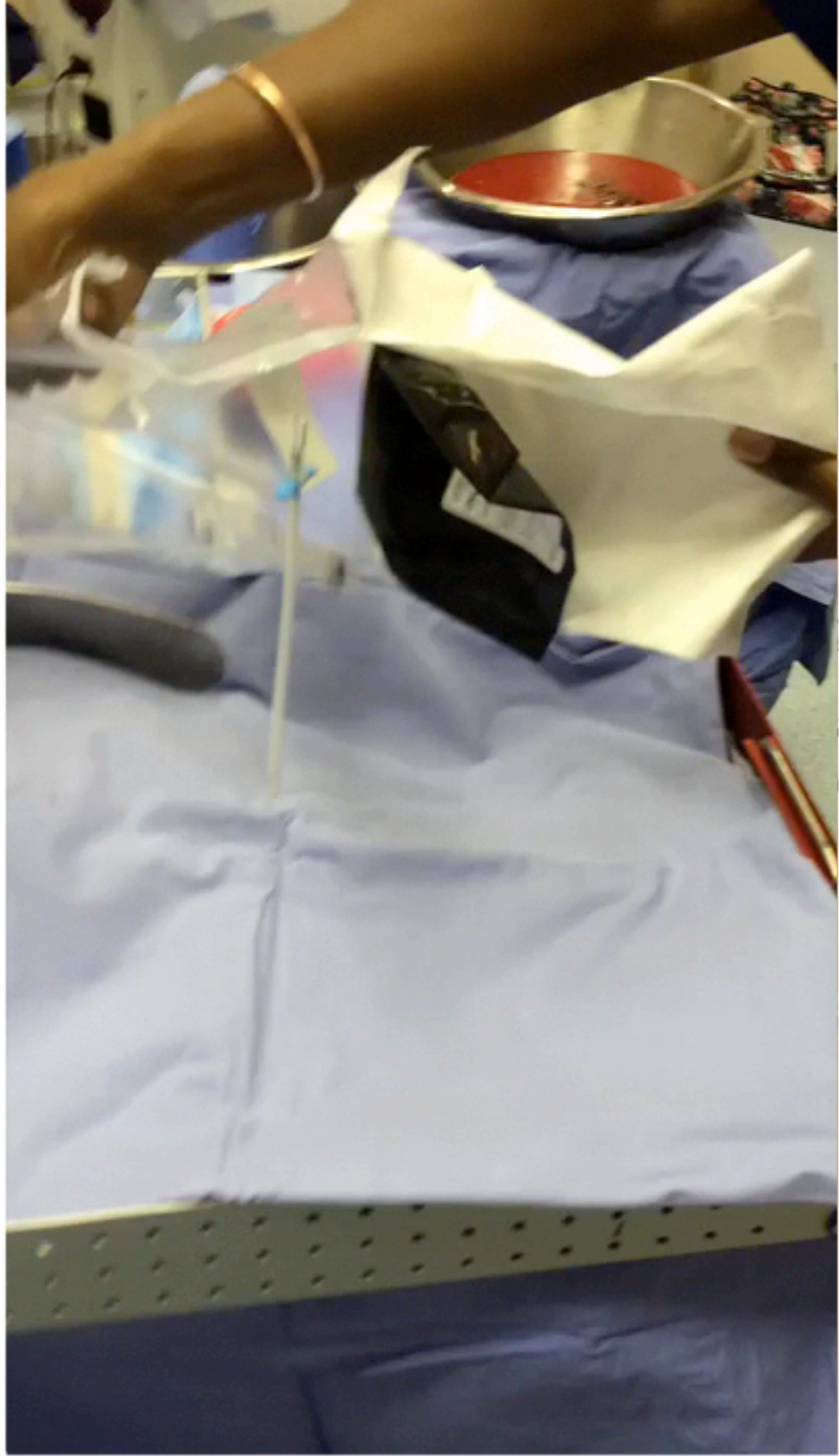




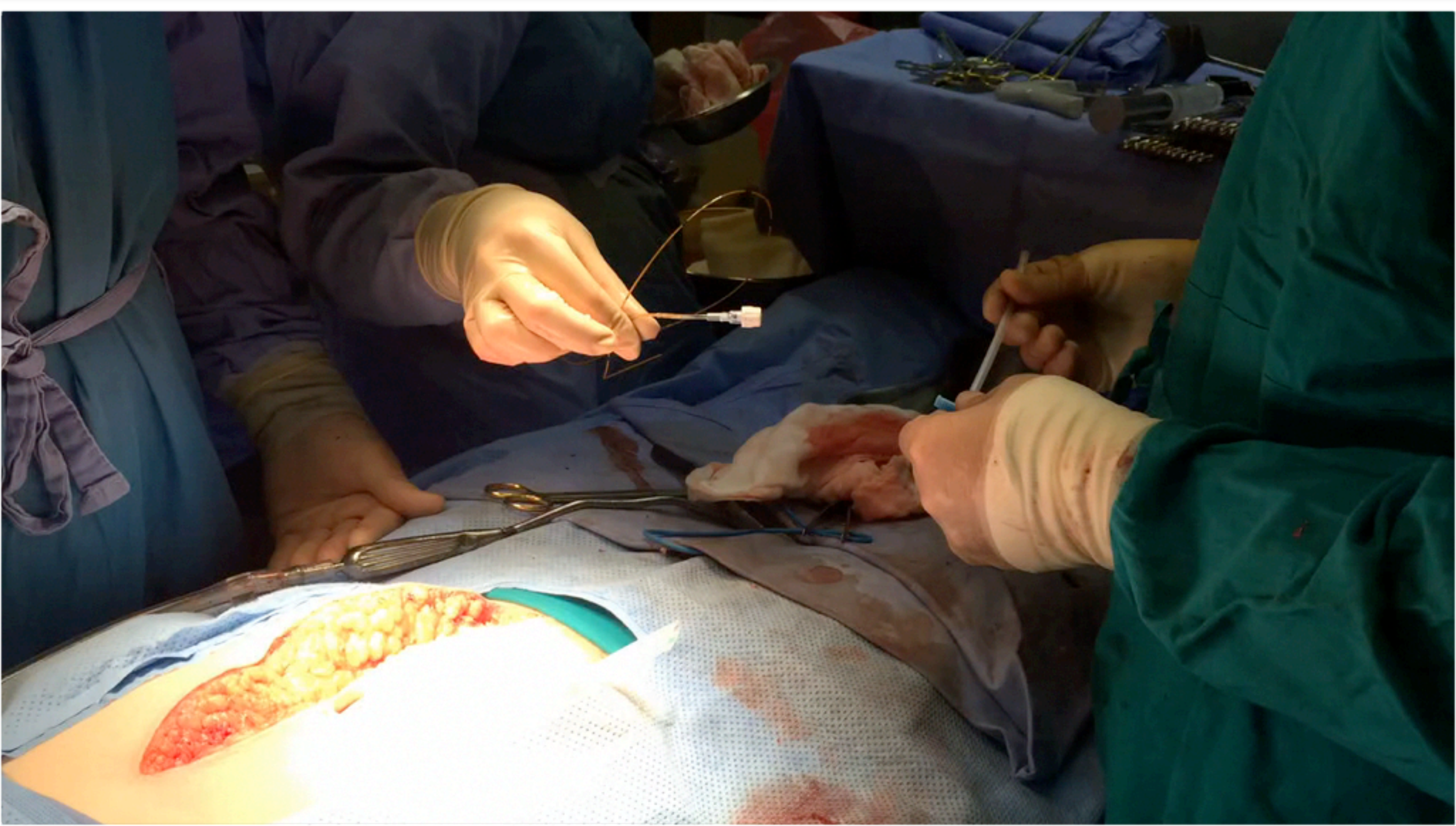






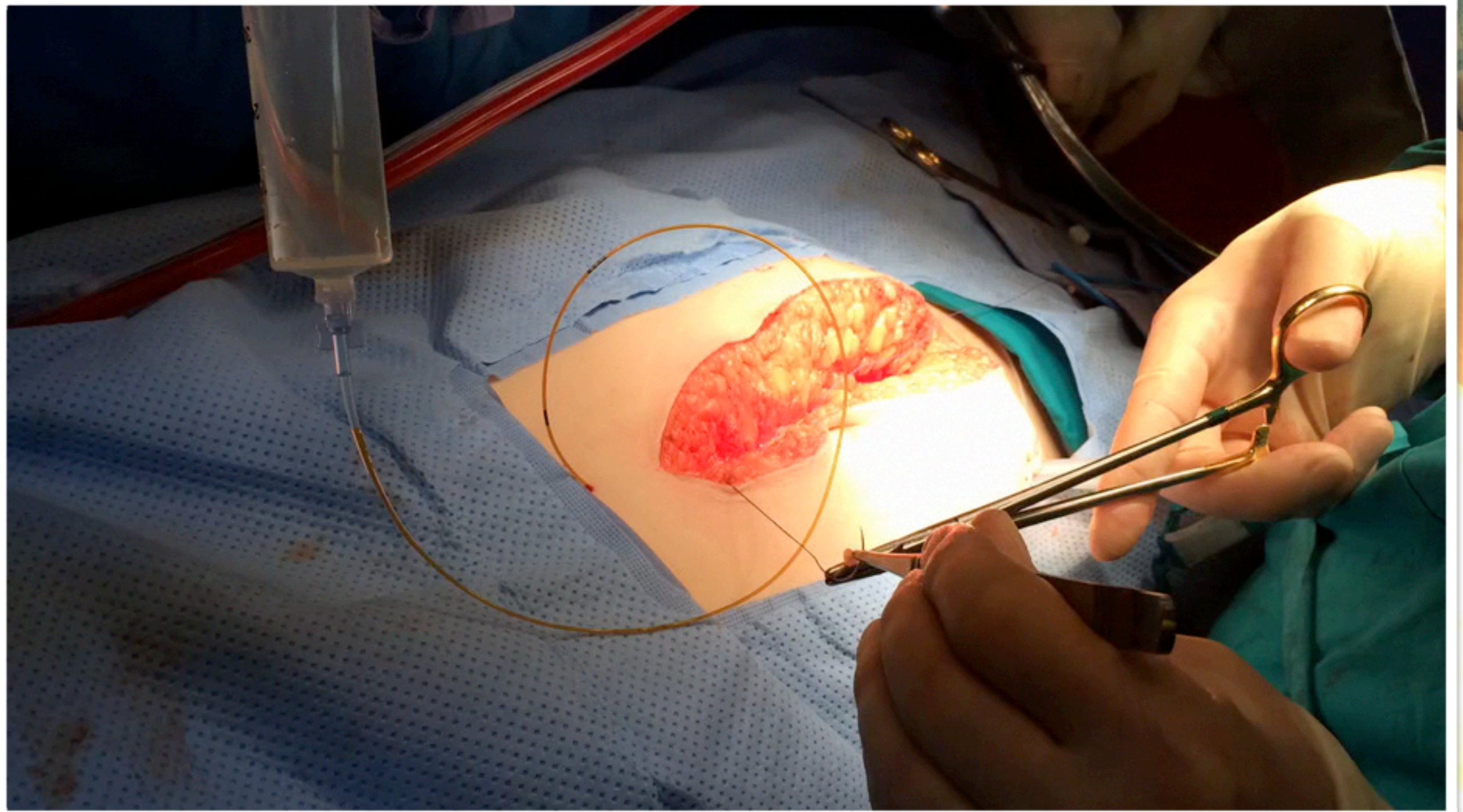








geon.com









Two glass test tubes are shown against a white background. The tube on the left is vertical and contains a blue liquid. The tube on the right is tilted and also contains a blue liquid. The text is overlaid on the upper part of the tubes.

**“reflections of these characteristics into clinical practice have not been evident”**



**"clinical doses of local anesthetics are usually at the top of the dose–response curves in order to assure the highest possible efficacy"**





**Ready LB, Oden R, Chadwick HS, Benedetti C, Rooke GA, Caplan R, et al. Development of an anesthesiology- based postoperative pain management service. Anesthesiology . 1988;68:100–106.**

**Practice Guidelines for Acute Pain Management in the Perioperative Setting. An updated report by the American Society of Anesthesiologists Task Force on Acute Pain Management. Anesthesiology . 2004;100:1573–1581.**



WRONG

**BTTWWADI**



# Recipe



- ◆ Preoperative
- ◆ Premedication
- ◆ Preemptive or preventative
- ◆ USGRA
- ◆ TCI
- ◆ Multimodal pharmacology





Thank you!