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Rebound pain: distinct pain phenomenon or nonentity?

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Ambulatory surgery is the new normal: over half of all surgery is carried out in an ambulatory (day-case) setting, and this number continues to grow.^{1–4} Ambulatory surgery is no longer restricted to minor surgery in young, healthy individuals, far from it. Increasingly complex surgery is regularly performed in patients with increasingly complex comorbidities, and older age *per se* is no longer seen as a barrier to day-case surgery.^{1,2} This is possible because of a combination of technological advances, improvements in anaesthesia and surgery,⁵ and use of patient selection criteria that take into account relevant surgical, medical, and social factors.^{2,5}

Regional anaesthesia offers many advantages in the ambulatory setting: high-quality perioperative analgesia, reduced opioid requirements, reduced postoperative nausea and vomiting, shorter duration of hospital stay, lower hospital readmission rates, lower rates of nosocomial infection, lower morbidity and mortality, and high levels of patient satisfaction.^{3,4,6,7} There is evidence that regional anaesthesia may have a role in reducing the risk of progression from acute to chronic pain.^{7,8} It is also believed that regional anaesthesia has immunomodulating effects that may reduce recurrence of some cancers,^{7,9} although this remains a controversial issue.

There is no question that it is very satisfying to see patients completely pain free, not requiring opioids, able to bypass the postanesthesia care unit (PACU) in many cases, and soon ready for discharge home after surgery. But, how much do we really know about what happens to them once they leave the hospital? It is an inevitable corollary of ambulatory surgery that patients are not subjected to the same level of postoperative surveillance compared with inpatients.⁵ The advantages of both ambulatory surgery and regional anaesthesia disappear when unplanned use of healthcare resources becomes necessary in the days immediately after surgery.^{2–4,7,10} Severe postoperative pain is the main reason for patients seeking medical attention following discharge home after ambulatory surgery,^{10–12} although reassuringly, the vast majority of those who seek

help in the first 7 days after ambulatory surgery do not require readmission to hospital. Of those who do, pain is not the principal reason for readmission.^{10–12} Nevertheless, sustained high-quality analgesia is the standard to aspire to.

Rebound pain is a recently introduced term used to describe acute postoperative pain occurring after regression of the sensory block associated with regional anaesthesia.¹³ It has been observed to occur after both peripheral nerve block and neuraxial anaesthesia.⁴ It has been variously defined,⁷ but as yet, there is no firm consensus on a formal definition. Indeed, it is not a concept that has garnered universal acceptance as a distinct pain phenomenon. It can be argued that a relatively abrupt unmasking of the typical nociceptive pain trajectory is purely a consequence of inadequate pre-emptive administration of multimodal analgesia.¹⁴ Alternatively, it may represent a form of exaggerated hyperalgesia uniquely associated with local anaesthetic use.⁷ Current evidence supports the former concept.⁷ Regardless of the mechanism, it is a fact that many patients who receive regional anaesthesia, either as the sole anaesthetic technique or combined with general anaesthesia or sedation, experience intense pain upon resolution of sensory block.^{4,6,7,15,16} On balance, it seems reasonable to assign a term to describe this pain phenomenon, if for no other reasons than to prioritise investigation that could lead to development of more effective postoperative analgesia strategies, and to open up a dialogue in the literature. Across the board, it turns out we are not very good at providing effective postoperative analgesia.^{17,18} There is evidence that postoperative analgesia is suboptimal in more than half of all patients undergoing surgery,¹⁹ and considerable effort has been expended in attempts to identify factors with predictive value for postoperative pain.²⁰

In this issue of the *British Journal of Anaesthesia*, Barry and colleagues²¹ report the findings of a single-centre retrospective cohort study designed to identify factors associated with rebound pain after use of peripheral nerve block for ambulatory surgery. The study is subject to some limitations associated with retrospective data collection, notably a heterogeneous study population and, arguably most importantly, wide variation in

postoperative analgesia prescribing across the study cohort. However, judicious use of inclusion and exclusion criteria coupled with robust statistical analysis has resulted in a useful data set from which some interesting and clinically relevant conclusions can be drawn. Rebound pain was deemed to be present when mild pain (numerical rating scale [NRS] pain score ≤ 3) transitioned to severe pain (NRS pain score ≥ 7). Of 972 patients who underwent a range of upper and lower limb operations, where peripheral nerve block featured in their anaesthetic care, about half (49.6%) experienced rebound pain. Thus, rebound pain is common.

In addition to recording the occurrence of rebound pain, a rebound pain score (RPS) was calculated for each patient. Williams and colleagues¹³ previously introduced a formula for calculation of the RPS. A key advantage of their methodology over that in the current study was the use of pain scores from formal pain diaries. Barry and colleagues²¹ used a modified version of this formula in their study. Both can be represented as equations (Box 1). Arguably, the parameters recorded in the modified RPS are more objective. However, if the patient bypasses the PACU, it would be necessary to record the pain score immediately before leaving the operating theatre suite in lieu of the lowest recorded pain score in the PACU. Both methods are independent of the duration of time spent in the PACU, but the pain scores used to calculate the RPS by Williams and colleagues¹³ were spread over a variable time period determined by the duration of the peripheral nerve block. Thus, on the face of it, the modified RPS appears more consistent, as it uses pain scores obtained over a defined 24 h period and does not rely on a subjective determination of when the peripheral nerve block has stopped working. Barry and colleagues²¹ observed a statistically significant difference between the RPS in patients categorised with rebound pain vs those without. This may be an indication that the RPS has utility as a research tool or as a clinical measure to investigate rebound pain in the ambulatory surgery setting. However, these scoring systems need to be subjected to formal investigation before any firm conclusions about their validity can be drawn.

Factors identified in the study to be associated with a high risk of rebound pain using univariate and multivariate logistic regression models fit into one of two categories: non-modifiable

Box 1

$$\text{RPS} = \text{HNRS}(12) - \text{NRS}(B)$$

$$\text{MRPS} = \text{HNRS}(24) - \text{LoNRS}(\text{PACU})$$

Equations for calculation of rebound pain score (RPS), and modified rebound pain score (MRPS). NRS, numerical rating scale pain score; HNRS(12), highest NRS pain score reported in the 12 hour period subsequent to the time the patient first reports the block is no longer providing pain relief; NRS(B), last NRS pain score reported when the nerve block was deemed to be still working; HNRS(24), highest NRS pain score reported in first 24 hours after peripheral nerve block was performed; LoNRS(PACU), lowest NRS score in PACU; PACU, post anaesthetic care unit. Devised based on descriptions by Williams and colleagues¹³ and Barry and colleagues.²¹

factors (younger age, female gender, bone surgery, and upper limb surgery) and modifiable (absence of intravenous dexamethasone). Further analysis using a machine-learning algorithm determined that bone surgery was, by a substantial margin, the most significant determinant of the severity of rebound pain. It also identified two additional factors not revealed with multivariate regression: the type of local anaesthetic drug used and the duration of motor block. These additional factors were not discussed further, but warrant future consideration, as they are potentially modifiable, so may offer additional opportunities to mitigate the impact of rebound pain.

At a first glance, it may appear that these findings offer little scope for altering the course of rebound pain, but this is by no means the case. Knowing which patient characteristics are linked to a high incidence of rebound pain offers an opportunity to educate patients²² on what to expect, potentially modify regional anaesthetic techniques to extend the duration of sensory block, and to adjust postoperative analgesia strategy taking the additional risk into account. However, before it will be possible to put the findings into clinical context, many ongoing controversies will need to be settled. Extending the duration of action of single-shot peripheral nerve blocks continues to be the subject of considerable attention. The literature offers more questions than answers when it comes to the use of perineural or systemic adjuvants²³ (notably dexamethasone),^{24–27} novel formulations of local anaesthetics, such as sustained release (liposomal) bupivacaine,²⁸ and use of indwelling peripheral nerve block catheters^{29,30} in both an ambulatory and non-ambulatory setting.

The overarching paradox is that, despite the high incidence of rebound pain reported in this study, patients reported high levels of satisfaction with peripheral nerve block, with 96% of patients stating they would opt for regional anaesthesia again. Nevertheless, it is time we started to translate the results of research on the diverse range of factors influencing postoperative pain into tangible effective pain relief regimes.

Declarations of interest

The author declares that they have no conflict of interest.

References

- Hall MJ, Schwartzman A, Zhang J, Liu X. Ambulatory surgery data from hospitals and ambulatory surgery centers: United States, 2010. *Natl Health Stat Rep* 2017; **102**: 1–15
- Lee JH. Anesthesia for ambulatory surgery. *Korean J Anesthesiol* 2017; **70**: 398–406
- Gabriel RA, Ilfeld BM. Use of regional anesthesia for outpatient surgery within the United States: a prevalence study using a nationwide database. *Anesth Analg* 2018; **126**: 2078–84
- Lavand'homme P. Rebound pain after regional anesthesia in the ambulatory patient. *Curr Opin Anaesthesiol* 2018; **31**: 679–84
- Stessel B, Fiddlers AA, Joosten EA, et al. Prevalence and predictors of quality of recovery at home after day surgery. *Medicine (Baltimore)* 2015; **94**: e1553
- Sort R, Brorson S, Gögenur I, Nielsen JK, Møller AM. Rebound pain following peripheral nerve block anaesthesia in acute ankle fracture surgery: an exploratory pilot study. *Acta Anaesthesiol Scand* 2019; **63**: 396–402
- Muñoz-Leyva F, Cubillos J, Chin KJ. Managing rebound pain after regional anesthesia. *Korean J Anesthesiol* 2020; **73**: 372–83

8. Hutton M, Brull R, McFarlane AJR. Regional anaesthesia and outcomes. *BJA Educ* 2018; **18**: 52–6
9. Le-Wendling L, Nin O, Capdevila X. Cancer recurrence and regional anesthesia: the theories, the data, and the future in outcomes. *Pain Med* 2016; **17**: 756–75
10. Loewenstein SN, Bamba R, Adkinson JM. Emergency department utilization after administration of peripheral nerve blocks for upper extremity surgery. *Hand* 2020. <https://doi.org/10.1177/1558944720963867>. Advance Access published
11. Sunderland S, Yarnold CH, Head SJ, et al. Regional versus general anesthesia and the incidence of unplanned health care resource utilization for postoperative pain after wrist fracture surgery: results from a retrospective quality improvement project. *Reg Anesth Pain Med* 2016; **41**: 22–7
12. Sivasundaram L, Wang JH, Kim CY, et al. Emergency department utilization after outpatient hand surgery. *J Am Acad Orthop Surg* 2020; **28**: 639–49
13. Williams BA, Bottegall MT, Kentor ML, Irrgang JJ, Williams JP. Rebound pain scores as a function of femoral nerve block duration after anterior cruciate ligament reconstruction: retrospective analysis of a prospective, randomized clinical trial. *Reg Anesth Pain Med* 2007; **32**: 186–92
14. Marhofer P, Hopkins PM. Anaesthesiologists versus surgeons, or regional anaesthesia versus local anaesthesia? *Br J Anaesth* 2020; **124**: 126–8
15. Henningsen MJ, Sort R, Møller AM, Herling SF. Peripheral nerve block in ankle fracture surgery: a qualitative study of patients' experiences. *Anaesthesia* 2018; **73**: 49–58
16. Thillainadesan T, Lee C, Mandaleson A, Hardidge A, Weinberg L, Tan CO. Rebound pain after shoulder surgery with interscalene blockade: how often? How bad? *J Pain Manag* 2019; **12**: 147–54
17. Pogatzki-Zahn EM, Segelcke D, Schug SA. Postoperative pain—from mechanisms to treatment. *Pain Rep* 2017; **2**: e588
18. Gan TJ. Poorly controlled postoperative pain: prevalence, consequences, and prevention. *J Pain Res* 2017; **10**: 2287–98
19. Chou R, Gordon DB, de Leon-Casasola OA, et al. Management of postoperative pain: a clinical practice guideline from the American pain society, the American society of regional anesthesia and pain medicine, and the American society of anesthesiologists' committee on regional anesthesia, executive committee, and administrative council. *J Pain* 2016; **17**: 131–57 [published correction appears in *J Pain* 2016; **17**: 508–10. Dosage error in article text]
20. Trikha A, Singh PM. Predicting post-operative pain: still a long way to go! *J Anaesthesiol Clin Pharmacol* 2013; **29**: 433–4
21. Barry G, Bailey J, Sardinha J, et al. Factors associated with rebound pain after peripheral nerve block for ambulatory surgery. *Br J Anaesth* 2020
22. Dada O, Zacarias AG, Ongaigui C, et al. Does rebound pain after peripheral nerve block for orthopedic surgery impact postoperative analgesia and opioid consumption? A narrative review. *Int J Environ Res Public Health* 2019; **16**: 3257
23. Zhu T, Gao Y, Xu X, Fu S, Lin W, Sun J. Effect of ketamine added to ropivacaine in nerve block for postoperative pain management in patients undergoing anterior cruciate ligament reconstruction: a randomized trial. *Clin Ther* 2020; **42**: 882–91
24. Hewson D, Bedforth N, McCartney C, et al. Dexamethasone and peripheral nerve blocks: back to basic (science). *Br J Anaesth* 2019; **122**: 411–2
25. Marhofer P, Column M, Hopkins PM, et al. Dexamethasone as an adjuvant for peripheral nerve blockade: a randomized, triple-blinded crossover study in volunteers. *Br J Anaesth* 2019; **122**: 525–31
26. Morita S, Oizumi N, Suenaga N, Yoshioka C, Yamane S, Tanaka Y. Dexamethasone added to levobupivacaine prolongs the duration of interscalene brachial plexus block and decreases rebound pain after arthroscopic rotator cuff repair. *J Shoulder Elbow Surg* 2020; **29**: 1751–7
27. Holmberg A, Hassellund SS, Drægni T, et al. Analgesic effect of intravenous dexamethasone after volar plate surgery for distal radius fracture with brachial plexus block anaesthesia: a prospective, double-blind randomised clinical trial. *Anaesthesia* 2020; **75**: 1448–60
28. Hamilton TW, Athanassoglou V, Trivella M, et al. Liposomal bupivacaine peripheral nerve block for the management of postoperative pain. *Cochrane Database Syst Rev* 2016; **2016**: CD011476
29. Ilfeld BM. Continuous peripheral nerve blocks in the hospital and at home. *Anesthesiol Clin* 2011; **29**: 193–211
30. Eng HC, Riazzi S, Veillette C, et al. An expedited care pathway with ambulatory brachial plexus analgesia is a cost-effective alternative to standard inpatient care after complex arthroscopic elbow surgery: a randomized, single-blinded study. *Anesthesiology* 2015; **123**: 1256–66

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Measuring frailty in the older surgical patient: the case for evidence synthesis

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