Optimising erector spinae block local anesthetic loading dose: a comparison of ropivicaine concentrations

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Erector spinae blocks (ESBs) are gaining increasing recognition as an effective technique by which to achieve thoracic analgesia, particularly in the field of rib fractures (1). While research on efficacy of these blocks has been emerging, there is relatively little data on how to optimise them. In particular, the optimum local anaesthetic concentration and volume has not been established.

A volume of 3.4 mL per vertebral level has been postulated to achieve sufficient analgesia per desired dermatome, however there is a lack of data regarding duration of action of this volume (2). The 2018 case report by Luftig *et al.* recommended a strategy of using 40 mL of 0.25% bupivacaine in order to avoid local anaesthetic systemic toxicity, however, this contrasts to other reports which advocate smaller volumes with higher concentration (3,4). Kashani *et al.* highlight the lack of clarity in regard to the optimal dose, acknowledging that consensus on optimum local anaesthetic volume and concentration is lacking (5). Furthermore, a weight-based dosing guide has been suggested in order to maximise analgesic effect yet reduce risk of adverse outcomes (6). In cases of multi trauma, numerous regional blocks may be considered. For example, in the event of a coinciding neck of femur fracture. This highlights the importance of establishing the optimum minimum loading dose and volume for these blocks.

As part of a larger study (7-9) we looked at dosing for ESBs amongst 37 patients who sustained traumatic rib fractures. The average number of rib fractures amongst this group was 4.78±1.96. Ethics approval was granted by the Prince Charles Hospital Human Research Ethics Committee (HREC: LNR/2018/QPCH/45155). Data from patients receiving an ESB for the management of rib fractures between November 2017 and November 2018 was collected from electronic medical records. Data collected included initial bolus and subsequent programmed bolus dosing (concentration and volume), and mean time to breakthrough analgesia (time post initial loading dose until further analgesia requested) in patients whom an ESB catheter was sited. This allowed us to identify the proportion of patients in each dose regime who required additional analgesia prior to their next programmed bolus.

As seen in *Table 1*, a variety of different loading dose regimes were followed. When examining mean time to breakthrough analgesia, our study found dilute solutions of ropivicaine to be sufficient when comparing doses of 0.2% to higher concentrations of local anaesthetic. Similarly, there was no benefit found in number of patients requiring break through analgesia prior to the next scheduled bolus. No patients involved in the study suffered from local anaesthetic toxicity. Our study has inherent limitations due to the small patient numbers and heterogeneity in dosing regime, however it would appear that 0.2% ropivocaine may be sufficient and could theoretically allow for multiple blocks to be performed one a patient, while reducing the risks of local anaesthetic toxicity.

In conclusion, while the efficacy of ESBs has been increasingly well documented, evidence-based guidance regarding volume/concentration of local anaesthetic agent infiltrated remains lacking. Our study indicates that 0.2% ropivocaine may be comparable to higher doses of local anaesthetic, while theoretically lowering the risk of local anaesthetic toxicity. In order to provide greater guidance to physicians involved in these blocks, further information from larger randomised controlled trials is needed.

Table 1 Comparison of ESB loading doses and time to breakthrough analgesia

	15–20 mL, 0.2%	15–25 mL, 0.375%	25–30 mL, 0.375%	30 mL, 0.5%	10–20 mL, 0.75%	2% lig, 0.75% ropivocaine[†]
n	5	10	8	2	9	3
PIB reached prior to breakthrough analgesia	4	9	7	2	7	2
Mean time to breakthrough analgesia (hours)	20.432	19.269	14.32375	4.5	11.21555556	6.333333333
SD	19.23741459	13.13685439	12.65496846	2.121320344	7.701667208	8.386497084

[†], variable volumes used or not clearly documented. PIB, programmed intermittent bolus.

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Footnote

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