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# Do ultrasound-guided regional blocks signify a new paradigm in high-risk patients?

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It has been suggested for many years that regional anaesthesia is advantageous in high-risk patients, either as the sole anaesthetic or in combination with general anaesthesia. Regional techniques are safe and even more so when guided by ultrasound. In the high-risk patient population, ultrasound-guided regional anaesthesia (UGRA) can help decrease risk of perioperative morbidity and improve short-term as well as long-term outcomes, particularly in the orthopaedic, vascular, oncologic and chronic pain patient populations. Nevertheless, complications do still occur and benefits of a specific regional nerve blockade need to be weighed against potential risks on an individual basis.

The emergence of reasonably priced, easy-to-use ultrasound machines facilitates regional anaesthesia, and this kind of anaesthesia may become the standard of care in high-risk patients.



## Rationale of application of regional anaesthesia in high-risk patients

Successful regional anaesthesia effectively blocks neuronal afferent input and thereby provides superior opioid-free analgesia and attenuation of surgical pathophysiology [1,2]. A high-risk patient is a

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patient with increased probability of perioperative complications [3]. The risk is multifactorial and depends on the interaction of patient-, anaesthesia- and surgery-related factors [4,5]. Examples include procedures in patients with severe systemic disease, emergent major operations (particularly in the elderly), cardiovascular and thoracic surgery as well as prolonged procedures associated with large fluid shifts and/or blood loss [6].

As anaesthesiologists, we are obliged to choose the best anaesthetic for our patients under the given circumstances. Use of ultrasound-guided regional anaesthesia (UGRA) improves the success rate, decreases the time necessary to perform the block, decreases onset time, allows for reduction in the dose of required local anaesthetic and may improve safety by avoiding perineural structures such as vessels, pleura and the neuraxis compared with a conventional landmark technique [2,7]. Thus, it is feasible that UGRA may shift the risk–benefit ratio towards a peripheral regional technique, either alone or in combination with general anaesthesia, especially in high-risk patients [1]. Furthermore, the choice of anaesthesia and analgesic technique may also influence the risk of long-term outcomes such as cancer recurrence and chronic pain [2].

## What is regional anaesthesia?

Regional anaesthesia is characterised by the loss of sensation and/or strength in a circumscribed region of the body caused by injection of local anaesthetic either centrally via a neuraxial technique (intrathecal or epidural injection) or peripherally via peripheral nerve blockade of a specific nerve (or group of nerves). Generally, the safest strategy is to administer the local anaesthetic as distal as possible and only as proximal as necessary for the desired effect. Depending on the desired surgical or postoperative analgesic outcomes, the choice of technique is based on effectiveness (success rate), safety (risk) and ease of performance.

Regional anaesthesia in the form of neuraxial blockade is an effective and relatively easy way to provide surgical anaesthesia; however, it is often unsafe to perform on high-risk patients who are on systemic anticoagulation related to cardiovascular disease or limited mobility. Knowledge of anticoagulant dosing, timing and the American Society for Regional Anaesthesia (ASRA) and the European Society for Regional Anaesthesia (ESRA) guidelines for safe use of neuraxial anaesthesia is essential to avoid the devastating complication of an epidural or intrathecal haematoma [8]. In addition to anticoagulation concerns, intrathecal regional anaesthesia can also result in significant haemodynamic changes on induction as a result of sympathectomy and vasodilation; therefore, the practitioner should evaluate volume status before induction and consider giving a fluid bolus or use a gradual induction with an epidural catheter in patients with limited cardiovascular reserve. A preferable alternative for these high-risk patients on anticoagulation or with concern for significant haemodynamic changes is the use of peripheral UGRA. Nerve blocks have been shown to provide excellent anaesthesia and analgesia for a variety of surgeries, with a particular benefit on those undergoing surgery to the upper and lower extremity. Of note, the impact on haemodynamics is less severe with more peripheral blockade placement as the local anaesthetic is less likely to spread centrally to the epidural space. However, it also seems prudent to exert special attention to paravertebral blockades such as thoracic and lumbar paravertebral (lumbar plexus) blocks even though they are counted as a special subgroup of peripheral nerve blocks, due to the risk of subsequent epidural spread [9–11]. The efficacy of peripheral nerve blocks has been demonstrated previously, and ultrasound has been shown to significantly improve its role in high-risk patients [12].

## Why ultrasound?

UGRA provides many potential benefits when used for surgical anaesthesia in high-risk patients [13]. Ultrasound is the most effective and safe technique for target nerve location, needle guidance and accurate perineural injection of local anaesthetic. Today, paraesthesia and electrical nerve stimulation (ENS) techniques are obsolete for that purpose. In theory, ENS technique in combination with ultrasound can decrease the risk of nerve injury related to nerve blockade; however, that is speculative.