

Impact of modality of anesthesia on major amputation surgery

Abstract

Critical limb ischemia remains a therapeutic challenge and, despite best efforts from the surgical and interventional team, some of these patients will require major amputation. Despite advances in anaesthesia, surgical technique and critical care, there remains a significant 30-day mortality in this group. Recent quality improvement frameworks have sought to improve outcomes and we present our experience with general and regional anaesthesia in this cohort of patients.

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Introduction

Despite advances in angioplasty, stenting and surgical bypass there is still a requirement for major amputation in modern vascular surgery. In patients with severe unreconstructable critical limb ischemia or in those presenting with advanced gangrene it remains necessary.

Advances in anaesthesia, critical care and surgical technique mean that these operations can be carried out in increasingly frail patients, sometimes with palliative intent. Meanwhile, the increasing prevalence of obesity and diabetes, along with an ageing population, may mean that amputation becomes increasingly prevalent. Unfortunately, in large series, the procedure carries a 30-day mortality of between 9 and 17%.¹

Selection of amputation level remains a key decision. The commonest levels are transtibial (below knee) and transfemoral (above knee). Through-knee and hip disarticulation procedures are far less common. Transtibial amputation is favoured in younger, fitter patients where its propensity for ambulation and subsequent independence can be balanced against the relatively higher blood loss and possibility for ischemic wound breakdown. Conversely, transfemoral amputation is associated with swifter operation time, lesser blood loss and more assured wound healing; this must be balanced against the difficulty of ambulation and the real possibility that elderly patients with a transfemoral procedure will be chair bound. Therefore, the selection of level of procedure must be individualized based on the specific comorbidities and rehabilitation potential of the patient.

Recent quality improvement frameworks have been implemented to guide and streamline the care for this complex patient group.^{1,2} This includes recommendations on perioperative care, multidisciplinary involvement and level of amputation. The frameworks especially emphasise the need for timeouts engagement by experienced vascular anesthetists. As a department we have been seeking to improve our perioperative outcomes for these patients, and have undertaken annual audit of perioperative mortality and amputation level.³ Complex concurrent medical problems and comorbidities are common in this

group and we sought to evaluate whether our methods of anaesthesia contributed to patient survival.

Methods

As a department, our perioperative survival rate after major amputation has been the subject of internal quality improvement audit since 2013.³ The cohort of patients undergoing major amputation (defined as amputation proximal to the ankle joint) in calendar year 2015 were identified. Level of amputation, operative (30-day) survival and anesthetic modality were collated. Patients undergoing amputation for trauma were excluded, as were patients undergoing through-knee and hip disarticulation procedures. No upper limb amputations were performed during this period. Any patient undergoing adjuvant nerve block in addition to their primary mode of anaesthesia was recorded. For the purpose of analysis, preoperative and intraoperative nerve blocks were considered together.

Results

Given the selection methodology of transfemoral and transtibial amputations, and the propensity for transfemoral amputations to be carried out in a less fit cohort of patients, both groups were considered separately. A total of 94 major amputations were carried out in 2015. 63 were above the knee, 31 below the knee.

In the above knee group, 55 patients survived at least 30 days giving an operative mortality of 12.6%. The below knee group fared better with 29 survivors to 30 days, giving an operative mortality of 6.4% (Table 1).

Overall the group of patients suitable for below knee general anaesthetic seem to fare best, with operative mortality of 5.3%. Patients suitable for above knee amputation under spinal alone seem at highest risk, with operative mortality 15.4%.

Very few (5/94) patients underwent amputation under GA without adjunctive peripheral block. More than half of the spinal anesthetic recipients also received adjunctive block.

Amputation level	Total number	GA alone	GA plus blocks	Spinal alone	Spinal plus blocks
Above knee	Total 63	Survived- 3	Survived- 25	Survived- 11	Survived- 16
	Mortality- 8	Mortality- 1	Mortality- 3	Mortality- 2	Mortality- 2
Below knee	Total 31	Survived- 1	Survived- 18	Survived- 4	Survived- 6
	Mortality- 2	Mortality- 0	Mortality- 1	Mortality- 0	Mortality- 1

The peripheral blocks used were a heterogenous group. A mix of pre-op blocks inserted both by anatomical landmarks and ultrasound guidance were placed. These were complimented by a number of direct perineural injections to the sciatic nerve, posterior tibial nerve and femoral canal during the procedure. It is not departmental policy to routinely use continuous wound infusion catheters for local anesthetic.

Discussion

It is not the intent of this small study to define the best practice for anaesthesia in major lower limb amputation. Rather, it is intended to allow informed discussion amongst the anesthetic and surgical teams about how best to manage this complex patient group.

To date, no randomized control trial has elucidated the optimal method of anaesthesia for major amputation. Trials have suggested a correlation between spinal anesthetic and improved cerebation after surgery,^{4,5} however the selection of patients for GA or spinal anesthetic is a complex and multifaceted decision. The use of adjunctive nerve blocks or catheter-based local anesthetic infusions is safe, not associated with excessive side effects and probably decreases perioperative opiate requirement.⁶

When we compare our figures to the recent 2014 NCEPOD report on lower limb amputation, our general anesthetic rates were marginally lower than national average, with 58% versus 61%.⁷ The connection between adopted anesthetic technique, and patient outcomes has for many years been debated, with spinal technique frequently thought to be advantageous. A recent systemic survey,⁴ showed only a reduction in lower respiratory tract infections associated with spinal anesthetic. Of note the NCEPOD report quoted this as the most common post-operative complication of their study.

The scenario of the anticoagulated patient requiring urgent amputation remains a challenge. Warfarin can be reversed relatively swiftly and easily, making spinal anaesthesia possible without excessive risk of paraspinal haematoma. However the effects of clopidogrel are more difficult to rapidly overcome, meaning that patients with a considerable burden of sepsis requiring urgent amputation may have no choice but to undergo GA.

The connection between peripheral nerve blocks and mortality cannot be shown, however we know that poor perioperative pain control is associated with phantom limb pain (PLP), in itself a significant morbidity and burden in this amputation population. It is hypothesised that pre-operative pain causes a CNS imprint, such that it could cause pain post-operatively. Evidence is mixed, and

larger studies fail to show a link between regional or peripheral nerve blockade and development of PLP. However our institution advocates early acute pain services involvement, utilisation of peripheral nerve blockade intra-operatively in an attempt to reduce PLP development.

Our data, whilst too small a sample size to draw definitive conclusions, support the current practice of offering both spinal and general anesthetic for major amputation. Of course the experience and preference of the anesthetic and surgical teams, as well as the preference of the patient themselves, will play a major factor in the decision making process.

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Conflicts of interest

The authors declare there are no conflicts of interest.

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