Challenges of central neuraxial anaesthesia and sedation in obese and morbidly obese patients undergoing prolonged lower limb free flap surgery

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Background

The Nuffield Orthopaedic Centre (NOC) is a tertiary and quaternary referral centre for complex orthopaedic patients with osteomyelitis (OM). The surgery is usually prolonged and joint with the reconstructive plastic surgery team for simultaneous free tissue transfer ("free flap") for poorly healing lower limb sites. A proportion of the patients presenting with OM have high BMI, with associated co-morbidities like type II diabetes, obstructive sleep apnoea and ischaemic heart disease. High BMI is also associated with increased complications and technical difficulties with both general and regional anaesthesia [1-2]. While central neuraxial anaesthesia and sedation (CNA+Sed) can be advantageous for prolonged lower limb free tissue transfer (LLFTT) surgery by providing improved surgical and patient reported outcomes [3], avoidance of airway interventions and good operative analgesia, high BMI can make its management more challenging with difficult insertion of CNA and maintenance of adequate but safe sedation levels [4]. We present results of an ongoing audit/QIP into the management of LLFTT patients, focusing on the anaesthetic challenges of obese patients and ways to modify the technique to improve the service in these high risk patients.

Methods

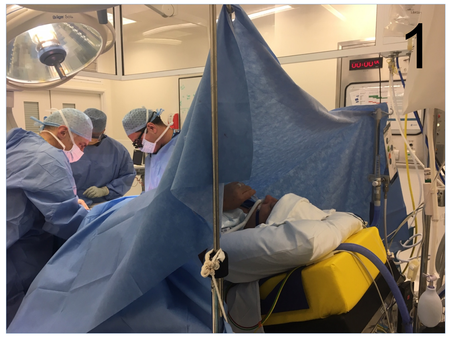
With institutional approval, we reviewed anaesthesia data collected prospectively and – retrospectively - case notes of patients with BMI≥ 30, who underwent LLFTTs under CNA +Sed performed at the NOC by/under supervision of one consultant anaesthetist. Of 85 cases reviewed (2007-onwards), there were 22 patients with BMI≥ 30 at the time of surgery.

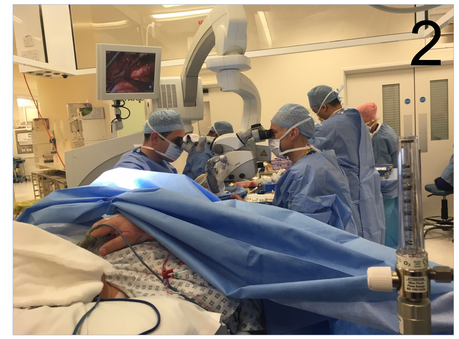
Results

Out of the reviewed 85 patients 22 (26%) were obese or morbidly obese, with BMI ranging from 30 to 44; four (18%) patients were morbidly obese with BMI ≥ 40 (see table below). The surgical procedures were performed in supine position and took between 6hr48min to 13hr45min. All cases were initially planned for anaesthesia under CNA+Sed. Neuraxial blockage was performed by the consultant in 20 cases, with two CNAs performed by senior trainees under supervision. Ultrasound assistance was used in 13 (59%) of the cases. First pass success with insertion was recorded in eight (36%) cases. Sedation was maintained using propofol TCI, midazolam and/or fentanyl boluses as required. In 12 patients, ketamine was added to propofol (1:5 ratio) for deeper sedation. In three patients some form of audio-visual distraction (AVD) was used, aiming to reduce anxiety and sedation requirements. All patients had invasive BP and arterial blood gases monitoring. Supplementary oxygen support was given via a face mask. With the advent of high flow nasal oxygenation (HFNO), two patients with obstructive sleep apnoea had HFNO to aid oxygenation under sedation (see pictures 1 & 2). Intraoperatively, there was one unplanned conversion to GA after initially successful CNA (CSE) block.

All patients were managed in a nurse-led HDU postoperatively, with no post-operative ITU transfers. Patient controlled epidural analgesia (PCEA) was provided postoperatively, aiming to continue for maximum 4 days as per trust Acute Pain Service (APS) protocol. In the cases reviewed, PCEAs were continued for mean 2.8 days (range 0-5), with regular APS follow up. Unfortunately in six patients, epidurals fell out early with need for initiation of PCA morphine or other oral analgesic alternatives. The flaps were successful in all patients but one, in whom BMI>40 and inadequate preoperative psychological preparation were important contributing factors [5].

No	BMI	Comorbidity	Anaesthesia	Intraoperative	Post operative
1	40	AF, HTN, ETOH excess	Epi, Sedation	Difficult CNA Insertion, stable maintenance	Epidural fell out day 1, PCA. Nil issues with free flap (FF)
2	41	TIA, Depression, OSA	Epi, Sedation, HFNO	pCO2 7.1 with oversedation, but resolved quickly	Comfortable, PCEA in situ 3 days. Nil issues with FF
3	42	Psoriasis, restless leg syndrome, severe anxiety, HTN	Epi, Sedation	Difficult CNA insertion due to psoriasis and emollients; very anxious and restless intraoperatively; high sedation requirements	Restless and non-compliant postoperatively in HDU: excessive pressure on FF in standing position; FF compromise and subsequent failure. Epidural catheter fell out/was pulled out
4	44	Asthma	Epi, Minimal Sedation	Easy CNA with minimal sedation	Comfortable, PCEA in situ 3 days. Nil issues with FF





^ Pictures 1-2 – Theatre set up for a LLFTT under continuous epidural anaesthesia, conscious sedation with propofol TCI and HFNO for oxygenation in a BMI≥ 40 patient

<Table – Summary of BMI ≥ 40 cases for LLFTT under CNA+Sed

Discussion

Complex orthoplastic reconstructions for bone infection are often prolonged procedures with significant risk of flap failure especially in high BMI patients [4-6]. Neuraxial anaesthetic techniques can improve success with microvascular reconstruction procedures by reducing peri-operative stress and catecholamine release with good analgesia, improved haemodynamic stability, thermoregulation and decreased vasospasm [7]. High BMI can be associated with difficult insertion of CNA, but US assistance may be useful in determining landmarks and needle entry [8]. In terms of sedation, a balanced approach is required to ensure comfort and anxiolysis, but without over-sedation, hypercarbia and loss of airway control, and techniques like ketamine with propofol, targeted infusions of sedation and audio-visual distraction may be useful. HFNO has also been used successfully in some of the cases, to provide oxygenation, along with moderate CPAP, humidification and improved patient satisfaction. In the cases reviewed, there was only one failed CNA+Sed, with conversion to GA around 3hrs into start of surgery due to agitation and, possibly, due to inadequate epidural component of the CSE. Post operatively, a functional epidural could improve flap perfusion as well as improve patient comfort. Unfortunately, in around 30% of the cases reviewed, epidurals fell out early with need for morphine conversion. Close monitoring and follow up by APS/anaesthetic cover is required to troubleshoot epidurals and ensure longevity of epidural infusions.

While numbers are small due to the nature of surgery, our results reassure that CNA+Sed provides safe anaesthesia for prolonged LLFTT surgery in high BMI patients. With the current facilities in our centre we recommend the following quality improving strategies for CNAs in high BMI patients: 1) preoperative optimisation with MDT approach; 2) use of Epidural vs CSE; 3) US-assistance for CNA insertion; 4) use of AVD to alleviate anxiety and reduce sedation requirements; 5) use of HFNO +/- addition of ketamine if deep sedation is required. Our findings can be applicable to management of high BMI patients undergoing different lower limb procedures.

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