



The Use of Regional Anesthesia for Vascular Surgery Known as Distal Revascularization with Interval Ligation Including Endoscopic Saphenous Vein Harvest

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Abstract

The ability to perform regional anesthesia on surgeries; which routinely require general anesthesia; allows us to avoid endotracheal intubation, limit systemic medications and reduce hemodynamic changes during surgery. The vascular procedure known as Distal Revascularization and Interval Ligation (DRIL) requiring an endoscopic saphenous vein harvest has been routinely done under general anesthesia. This case documents the use of regional anesthesia and moderate sedation in a 60 to 70 year old female who has been diagnosed with ischemic steal syndrome after a recent arteriovenous fistula creation. We performed a Supraclavicular, Femoral and Obturator nerve block. This combination of blocks successfully provided most of the anesthetic management for the procedure, in addition to postoperative analgesia, without complications.

Keywords: Regional anesthesia; Supraclavicular nerve block; Femoral nerve block; Obturator nerve block; DRIL Procedure; Vascular surgery

Introduction

End-Stage Renal Disease (ESRD) currently affects more than 350,000 Americans, and each year, this population increases by approximately 7% [1]. Creation of permanent vascular access through surgical construction of an Arteriovenous Fistula (AVF) is preferred for ESRD patients receiving chronic hemodialysis and places a significant emphasis on successful outcomes after angio-access surgery [2,3]. Approximately 25% of initial AVF placements will fail as a result of thrombosis or failure to develop adequate vessel size and blood flow [4]. The most important predictors of successful AVFs are increased vein diameter (>0.4 cm) and high fistula blood flow rates (>350 ml/min), however, recent studies have shown that anesthetic techniques used in vascular access surgery sedation, Regional Anesthesia (RA), and General Anesthesia (GA) may affect these characteristics and fistula failure as well [5]. Although uncommon, ischemic steal syndrome complicating fistula creation can be severely debilitating and can be seen in up to 5% of patients with upper extremity AVFs [6]. It is usually a result of arterial disease proximal or distal to the fistula and/or poor collateral supply to the hand. The incidence is higher in females and diabetics, and symptoms may include ischemic rest pain, neurological deficits, finger ulceration, and gangrene. The treatment of choice has been fistula ligation; however, this approach sacrifices the access and limits a patient's longer-term dialysis options. In 1988, Schanzer et al. developed a unique approach that combined arterial ligation to alleviate reversal of flow in the affected artery with the creation of a bypass to the distal ischemic area, reversing hand ischemia in more than 80% of the patients, and more importantly, preserving the access site. It was later named Distal Revascularization with Interval Ligation (DRIL) [6].

DRIL is a multistep procedure requiring Endoscopic Vein Harvest (EVH) commonly done under GA. The most common complications reported were related to the open saphenous vein harvest technique. It resulted in wound infections, skin and fat necrosis, and prolonged in-hospital stay, with morbidity rates close to 24% [7]. The combined use of preprocedural vein mapping and endoscopic vein harvest has significantly helped to reduce the rate of wound complications to less than 10% [8-10]. For a prolonged and complex vascular access procedure such as this, general anesthesia is frequently used; however, many patients requiring vascular access have severe comorbidities including cardiovascular disease, chronic lung disease, neuropathy, and/or immunosuppression. Comorbidities can lead to changes in the patient's hemodynamics, stress response, and potential drug interactions during general anesthesia, particularly in the ever-growing elderly population of

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dialysis patients [11]. In order to avoid endotracheal intubation, limit the requirement for systemic medications and reduce hemodynamic changes during surgery, we decided to pursue a novel regional anesthetic option to be done for this procedure.

Case Presentation

The patient described in the case has consented to the details and images used in this report. Our case features a 60 to 70-year-old female with a past medical history of chronic kidney disease stage IV, atrial fibrillation on Warfarin, diabetes, hyperlipidemia, hypertension, and morbid obesity who presented with steal syndrome as a complication of an AVF creation two weeks prior. The patient was scheduled to undergo a DRIL procedure with endoscopic harvest of the saphenous vein. To provide comprehensive regional anesthesia for the entire procedure involving the upper and lower extremities, a supraclavicular nerve block was performed for the upper extremity component of the procedure and femoral and obturator nerve blocks were performed to cover the endoscopic vein harvest (Figures 1-3). Our addition of an obturator nerve block was done with the goal of a more complete coverage of the endoscopic operative site. The blocks were done in the pre-operative unit vital signs were monitored, supplemental oxygen was administered and 100 mcg of Fentanyl IV for sedation was used. All nerve blocks were performed under ultrasound guidance with the exemption of the lower extremity ones, in which electrical stimulation was added for identification of structures as well. For all the nerve block performed we used a combination of Bupivacaine 0.5% and Lidocaine 2% was injected in an in-plane technique. The supraclavicular nerve block required a total volume of 10 mL. The same drug combination was used for the femoral nerve block for a total of 10 mL and lastly the obturator nerve block we injected 15 mL to achieve a full block. Despite the risks that have been described using this technique, such as unintentional damage of the surrounding anatomy, neuropathy, hematoma and an intended intravascular injection leading to local and cardiac toxicity, we observed no complications in the patient. During surgery the patient underwent the endoscopic vein harvest while simultaneously having the right upper extremity exposed to the level of the AVF. The patient's only complaint was a mild discomfort during the CO₂ insufflation required to insert the endoscope which was relieved by slightly lowering the pressure. The entire procedure was well tolerated. The patient received sedation with a single dose of 20 mg Ketamine administered at the beginning of the case and a continuous infusion of Propofol at 30 mg/hr. No pain medications were required throughout the duration of the surgery or in the immediate post-operative period while being monitored in the recovery unit. The patient had no post-operative pain to report. Nerve blocks continued providing pain relief for approximately 4 h after surgery. Once the analgesia provided by the blocks wore off, the patient required a combination of oral acetaminophen 650 mg and a single dose of oxycodone 5 mg until discharge.

Discussion

While there is no comparative data demonstrating that RA is superior to GA in the DRIL procedure, there have been several studies demonstrating the utility of regional anesthesia nerve blocks in numerous vascular procedures such as AVF creation. The blockade creates a sympathectomy, resulting in vasodilation that increases fistula blood flow, and it has the potential to affect site and vessel selection for the AVF [12]. Measured and calculated fistula blood flow in three anesthetic groups: Sedation, RA and GA demonstrating



Figure 1: Supraclavicular Block, BP: Brachial Plexus; SA: Subclavian Artery.



Figure 2: Femoral Nerve Block, FN: Femoral Nerve; FA: Femoral Artery.



Figure 3: Obturator Nerve Block, OBPos: Obturator Nerve Posterior; OBNAnt: Obturator Nerve Anterior.

that the blood flow increased most significantly and with minimal hemodynamic changes in the RA group as a result of its vasodilatory effect [13]. These studies have indicated that the use of RA may decrease the requirement of intraoperative inotropes, vasopressors, and narcotic medications, decrease length of hospital stay, and shorten overall procedural times [14]. Our case demonstrates a successful use of the combination of a supraclavicular nerve block with both femoral and obturator nerve blocks coupled with moderate sedation to provide anesthesia and post-operative analgesia for a DRIL procedure. While the advantages of regional anesthesia in this scenario need to be confirmed by large prospective clinical trials, based on our reported case, we can assume that patients will experience superior postoperative analgesia, shorter hospitalization, and even lower morbidity and mortality compared to any other anesthetic technique [15].

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