

# Intraoperative Direct Placement of Brachial Plexus Catheter for Forequarter Amputation Analgesia

Authors: Alisha Booms, DO, Austin Snyder MD, Robin Leopold MD, Andrew Tranmer MD, Conor O'Neill MD, Robert Nesbit MD, Paige Georgiadis, MD  
University of Vermont

## INTRODUCTION

Forequarter amputation (FQA) is a curative or palliative surgical treatment for oncologic tumors of the upper extremity with neurovascular involvement.<sup>1</sup> In palliative patients with advanced local metastasis of the shoulder girdle, FQA can provide useful pain relief.<sup>2</sup> Regional anesthesia is commonly utilized for lower extremity amputations, as well as more distal upper extremity amputations. This mode of analgesia is more challenging for FQA. We present a case of a patient requiring a FQA for cancer, who had good postoperative pain control using a combination of an ultrasound guided erector spinae plane (ESP) catheter as well as a catheter that was placed under direct visualization adjacent to the cut ends of the brachial plexus.

## CASE REPORT

A 67-year-old male with squamous cell carcinoma of the right hand had epitrochlear and axillary metastases which engulfed the brachial plexus and axillary artery. The patient then developed necrosis of the medial compartment of the right arm. He had previously been treated with immunotherapy, chemotherapy, and radiation. His necrotic wound had been treated with debridement and antibiotics for superimposed infection. He had significant pain with debridements. An interscalene nerve catheter was placed pre-operatively which helped with shoulder pain, though he did have residual axillary pain. Given difficult to control pain pre-operatively, as well as his relative intolerance to opioids, efforts were made to use regional anesthesia for post-operative pain control.

- An ESP catheter was placed preoperatively at the level of T2 to cover the innervation of the axilla from the intercostobrachial and cutaneous branches of intercostal nerves
- Direct placement of a nerve catheter intraoperatively next to cut end of the brachial plexus as the nerve emerged from the interscalene groove
- Intra-operatively, available muscle and fascia were sutured together used to create a “pocket” for catheter near brachial plexus, to provide a barrier to local anesthetic flow away from the nerve bundle

Regional anesthesia is a crucial aspect of multimodal pain control for FQA. **Direct visualization for placement of brachial plexus catheter is a viable option instead of ultrasound guidance when intra-operative surgical exposure allows.**

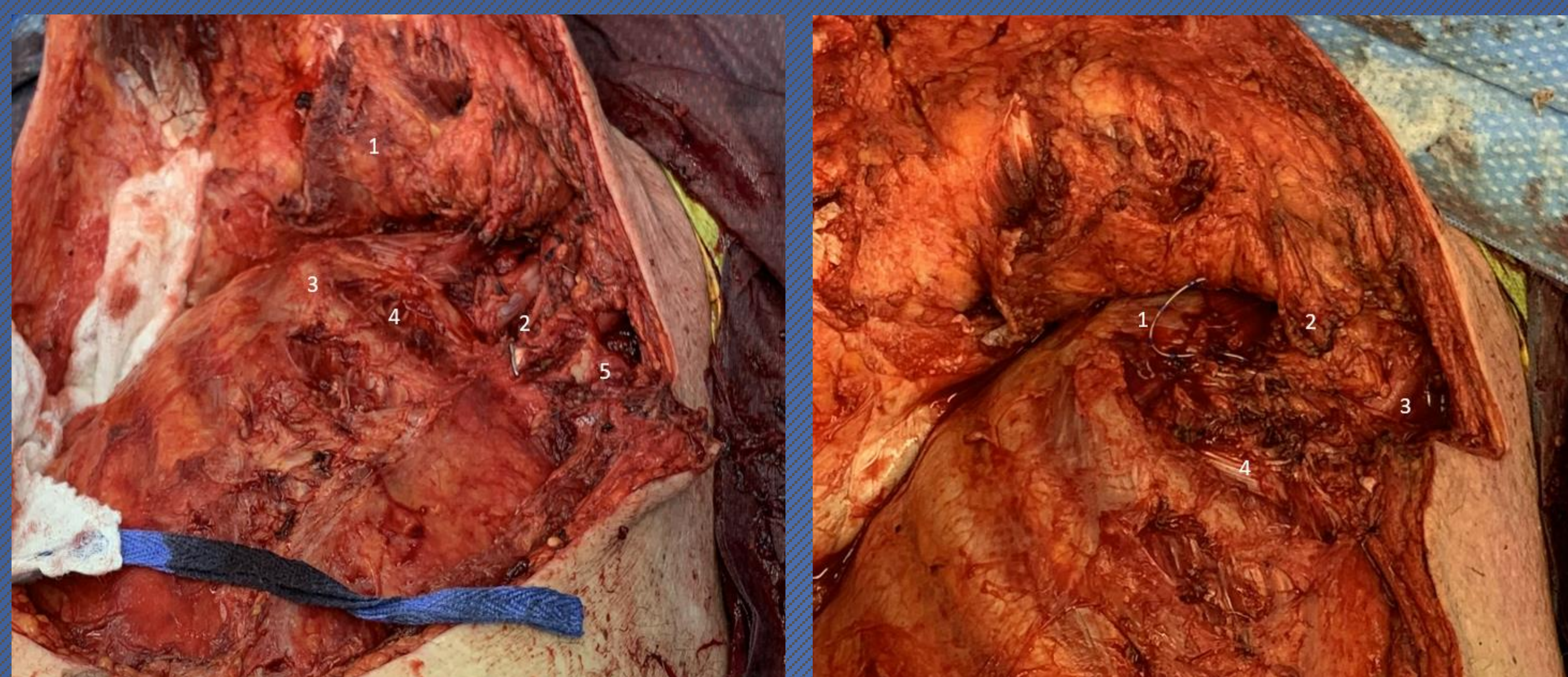


Figure 1 (right) demonstrates the surgical field of the right shoulder following forequarter amputation with elevation of the shoulder and upper arm skin flap. Here you can see (1) the shoulder skin flap, (2) cut ends of the brachial plexus, (3) ribs and (4) intercostal muscles, and (5) the cut end of the clavicle.

Figure 2 (left) demonstrates the (1) catheter coursing through the skin and into the pocket created by manipulation of the surgical muscles and fascia. The pocket was created by suturing adjacent muscles together, including the (2) scalene muscles, (3) sternocleidomastoid, and (4) intercostal muscle fascia.

## RESULTS

With regional techniques as part of a multimodal pain approach, our patient's pain was adequately controlled post-operatively.

- Previously spared axillary region was now well controlled with ESP catheter coverage of intercostobrachial nerve
- Brachial plexus catheter placed under direct visualization provided adequate analgesia

## DISCUSSION

The importance of post operative pain control is multifaceted.

- Development of stump pain, phantom sensations and intensity of acute postoperative pain play a role in the risk of development of chronic post amputation pain (cPAP,) suggesting the importance of post-operative pain control to mitigate cPAP.<sup>3</sup>
- Our patient had multiple risk factors for cPAP pre-operatively
- Prior reports show successful utilization of neural catheters placed under direct visual placement in the setting of traumatic amputation with primary goal to offer adequate post-operative analgesia and secondary goal to prevent development of chronic pain syndrome.<sup>5</sup>
- This case report demonstrates the efficacy of intraoperative nerve catheter placement adjacent to visible nerves, and suggests that the creation of a barrier to local anesthetic flow away from the nerve bundle using available muscle and fascia may be beneficial.

## REFERENCES

1. Elsner U, Henrichs M, Gosheger G, Dieckmann R, Nottrott M, Harges J, Streitbürger A. Forequarter amputation: a safe rescue procedure in a curative and palliative setting in high-grade malignoma of the shoulder girdle. *World J Surg Oncol*. 2016 Aug 15;14(1):216. doi: 10.1186/s12957-016-0973-7. PMID: 27526689; PMCID: PMC4986170.
2. Kaddoum RN, Burgoyne LL, Pereiras JA, Germain M, Neel M, Angheliescu DL. Nerve sheath catheter analgesia for forequarter amputation in paediatric oncology patients. *Anaesth Intensive Care*. 2013 Sep;41(5):671-7. doi: 10.1177/0310057X1304100513. PMID: 23977919.
3. Stone AB, Hollmann MW, Terwindt LE, Lirk P. Chronic post amputation pain: pathophysiology and prevention options for a heterogenous phenomenon. *Curr Opin Anaesthesiol*. 2023 Oct 1;36(5):572-579. doi: 10.1097/ACO.0000000000001298. Epub 2023 Jul 31. PMID: 37552016.
4. de Haan JB, Hernandez N, Sen S. Erector spinae block for postoperative analgesia following axillary hidradenitis suppurativa resection: a case report. *Local Reg Anesth*. 2018 Nov 15;11:87-90. doi: 10.2147/LRA.S179830. PMID: 30532584; PMCID: PMC6244584.
5. Granville-Chapman J, Tennant M, Aldington D, Smith SR, Nott DM. Direct placement of a brachial plexus neural catheter for analgesia after traumatic upper limb amputation. *Pain Med*. 2009 Sep;10(6):1132-5. doi: 10.1111/j.1526-4637.2009.00638.x. Epub 2009 Jun 1. PMID: 19496958.