Journal of Clinical Research in Pain and Anaesthesia
ISSN: 2689-6141

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Case Report *Volume 6 Issue 1*

Ultrasound Guided Superficial Cervical Plexus Block for Awake Carotid Ligation; New Wine in New Bottle

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Received Date: January 02, 2025; **Published Date:** January 22, 2025

Abstract

Carotid ligation was the first ever treatment modality for Internal Carotid Artery (ICA) aneurysm. Since then, various other surgical clipping and coiling techniques have developed. We revisited the "awake" carotid ligation technique in a 59-year-old lady with a left giant ICA aneurysm, requiring intraoperative neurological testing. Ultrasound-guided superficial cervical plexus block (SCPB) was ideal and the cornerstone of the anesthetic technique. The ultrasound guidance was used to precisely guide injection and provide excellent analgesia, in a cooperative, arousable patient. Good preoperative counseling played an equally important role in the successful conduct of this challenging case, with a good outcome.

Keywords: Giant ICA aneurysm; Awake carotid ligation; Ultrasound guided Superficial Cervical Plexus Block

Abbreviations

ICA: Internal Carotid Artery; CCA: Common Carotid artery, SCPB: Superficial Cervical Plexus Block; PAO: Parent Artery Occlusion; EC-IC: Extracranial-Intracranial; USG: Ultrasound-Guided.

Introduction

Internal Carotid Artery (ICA) aneurysms have a 5-10% global prevalence [1]. Commonly asymptomatic for most of their course, only presenting later with mass effect as they grow, causing thromboembolic features, mass effect, or rarely rupture. The treatment options include surgical, interventional, and multimodal approaches, further categorized as reconstructive and deconstructive techniques [2].

While, reconstructive techniques, mainly including surgical clipping, interventional coiling, bypass, and flow-diverter procedures, are popular in contemporary practice, with their superior safety profile, there are clinical scenarios when the risk-benefit ratio favors the older deconstructive techniques including parent artery occlusion (PAO). One such scenario was encountered in our patient with a giant ICA aneurysm involving the intracavernous portion of the artery. Subjecting this patient to craniotomy and opening of the cavernous sinus for clipping or an Extracranial-Intracranial (EC-IC) Bypass had an increased risk of morbidity, complications, and unfavorable postoperative outcomes.

Carotid ligation was the first procedure to treat giant ICA aneurysms. However, it lost popularity due to postoperative neurological complications. Revisiting this technique with advances in technology and drugs was beneficial in such a

special situation.

Case Presentation

A 59-year-old female presented with left lateral gaze restriction since a month. On neurological workup and imaging, she had a 3.2 x2.4 x2.3 centimeter large saccular aneurysm arising from the junction of cavernous and clinoid segments of left ICA, superiorly abutting left optic nerve and chiasma, involving the intracavernous course of the artery, with no evidence of intraluminal thrombosis.

Following a cross-consultation the patient was posted for awake carotid ligation, to facilitate intraoperative clinical neurological testing. Since the ligation was planned to be done in its cervical course, via a neck incision, an ultrasound-guided (USG) superficial cervical plexus block (SCPB) was planned. A day prior, Carotid Balloon Occlusion test was done by the neurointerventionalist, and it was well tolerated. During the preoperative visit, the patient was counseled and consented to the procedure and her involvement in the neurological testing.

In the operating room, her baseline vital parameters were normal. Her left radial artery was cannulated under local anesthesia, for real-time invasive blood pressure monitoring. Ultrasound-guided Left Superficial Cervical plexus block (Figure 1) was given with 15mL of Bupivacaine 0.3%, Lignocaine 0.8%, and 1500IU Hyaluronidase. Additionally, 5mL of the same solution was infiltrated along the left mandibular edge to cover pain due to prolonged retraction. The patient was positioned supine with the head turned contralaterally. Oxygen was provided with a Hudson-mask.

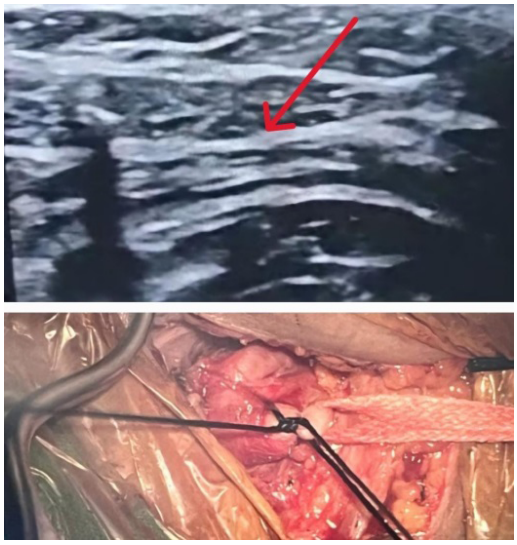

Figure 1: Top panel: sonoanatomy of injection site of SCPB, Lower panel: Ligation of Carotid artery [3].

Intraoperatively, analgesia was supplemented with intravenous Paracetamol 1gm and a continuous remifentanil infusion at 0.05-0.1µg/kg/minute titrated as per her hemodynamics and surgical stimulus.

After applying a temporary clip over ICA, her speech and motor function of the right upper and lower limbs were tested. Continuous EEG and clinical testing were performed and only after ensuring the absence of clinical ischemic signs for 20 minutes, permanent carotid ligation was done. After ligation testing was done for 10 minutes, and satisfactory results were ensured before closing the surgical wound. In case of observed intraoperative neurological deficit, the backup plan was to release the ligated artery and place an Extracarotid-Intracarotid bypass to alleviate the disease progress.

Postoperatively, the patient was kept in ICU for 24 hours for observation and neuromonitoring. The perioperative course was uneventful. Her follow-up at 3 and 5 months revealed a good neurological outcome.

Discussion

The global prevalence of intracranial aneurysms is about 5-10%. Internal Carotid Artery (ICA) aneurysms are described based on their size, with the adjective “Giant” being used for aneurysms >2.5cm in diameter (representing 5% of Intracranial aneurysms) [1].

In Giant ICA Aneurysms, surgical, endovascular, or combined intervention therapy is mainly in symptomatic patients, and rarely secondary to rupture. Surgical techniques include clipping, with or without bypass construction followed by parent artery ligation. These have been replaced in the past decade by endovascular procedures including Therapeutic Balloon Occlusion, selective coiling with or without a balloon or stent assistance, and flow diverter placement [4].

The Hunterian carotid ligation popularized by John Hunter was used by many surgeons for giant aneurysms for almost a century until it lost popularity owing to its high association with Ischemic outcomes including aphasia, dysarthria, and hemiplegia [5]. Although taken up only after balloon carotid occlusion test and even with Extracarotid-Intracarotid bypass placement, the ischemic risk cannot be obliviated. This risk is higher with ICA ligation than with Common Carotid artery (CCA) occlusion [6]. Owing to these anticipated risks, it seems only reasonable to do this procedure with continuous intraoperative neurological monitoring to achieve the goal of successful isolation of the aneurysm without adverse neurological outcomes.

The cervical plexus provides sensorimotor innervation majorly to the neck with some chest-wall coverage [7].

Superficial, Intermediate, and Deep Cervical plexus blocks, are all useful for surgeries in the neck depending on dermatomes that need to be blocked. For the operative area in our patient, we chose the Superficial Cervical Plexus Block (SCPB) along with additional infiltration along the mandibular edge. The block provided effective anesthesia and postoperative pain relief. SCPB provides anesthesia and analgesia by blocking sensory innervation in the anterolateral neck, auricle, and over the clavicle, and motor innervation to many muscles in the neck. SCPB has very few complications, associated only with landmark-guided techniques. SCPB has no absolute contraindications and its benefits usually outweigh the risks [3].

Ultrasound guidance enables the anesthetist to perform a precise block with a smaller drug volume and reduced risk of vascular trauma. However, this block only covers the dermatomal distribution of C2-C4, sparing the inferior border of the jaw, supplied by afferents from the facial nerve. This area can be covered by infiltrating a small volume of local anesthetic along the mandibular edge [8].

Remifentanil provided effective analgesia, stable hemodynamics, and an arousable cooperative patient during surgery [9]. Due to its ultra-short action, it is easily titratable according to clinical needs.

Conclusion

We revisited an effective surgical treatment modality and improved its safety profile using an ultrasound-guided superficial cervical plexus block which was the mainstay of the technique facilitating collaboration between the neurosurgical and the neuroanesthetic teams providing optimal operating conditions for awake neurological testing with excellent patient outcomes.

Conflict of Interest

Nil

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