



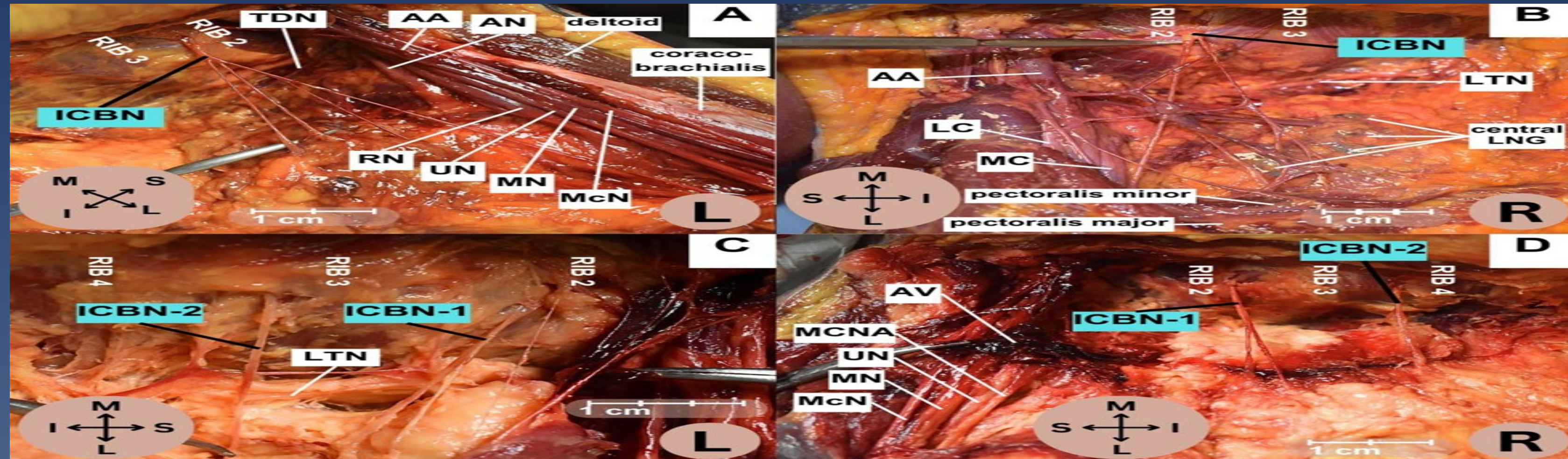
A journey to the center of the armpit: Mapping axillary sensory cutaneous nerves for enhanced analgesic approaches in breast cancer surgery

Abhijit Biswas; Brittany Zurkan; Timothy Wilson

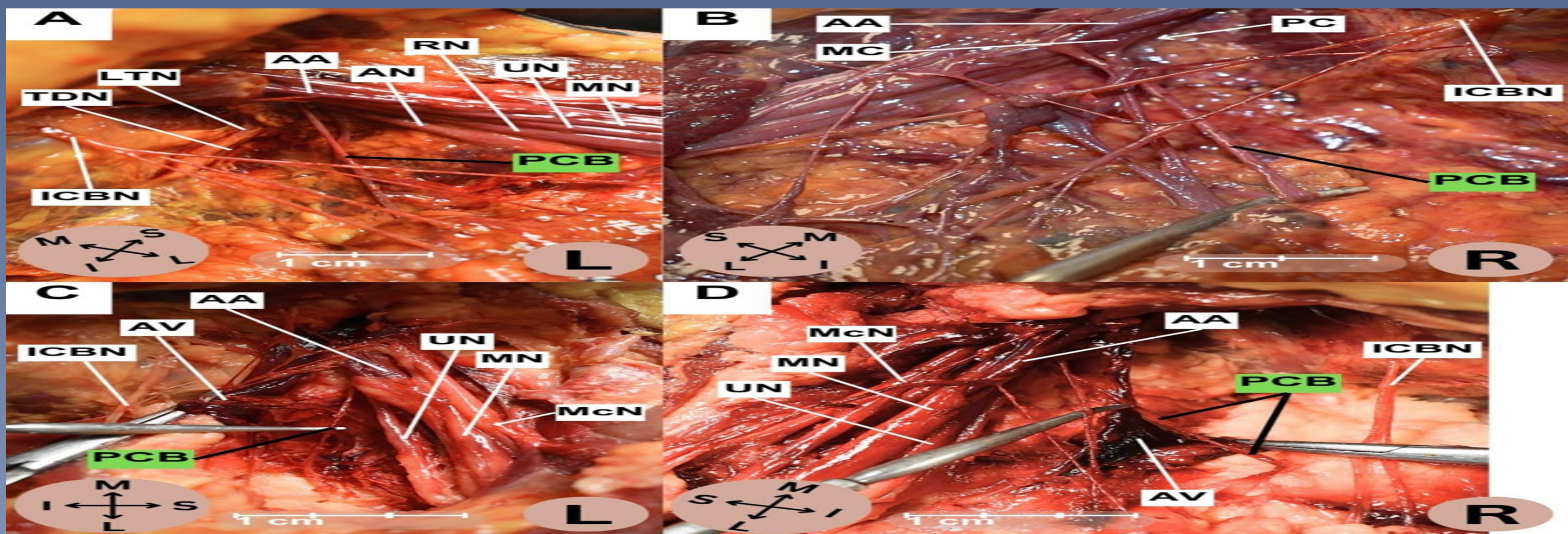
Assistant Professor, Department of Anesthesia and Perioperative Medicine, Western University
MSc student, Department of Anatomy and Cell Biology, Western University
Professor, Department of Anatomy and Cell biology, Western University



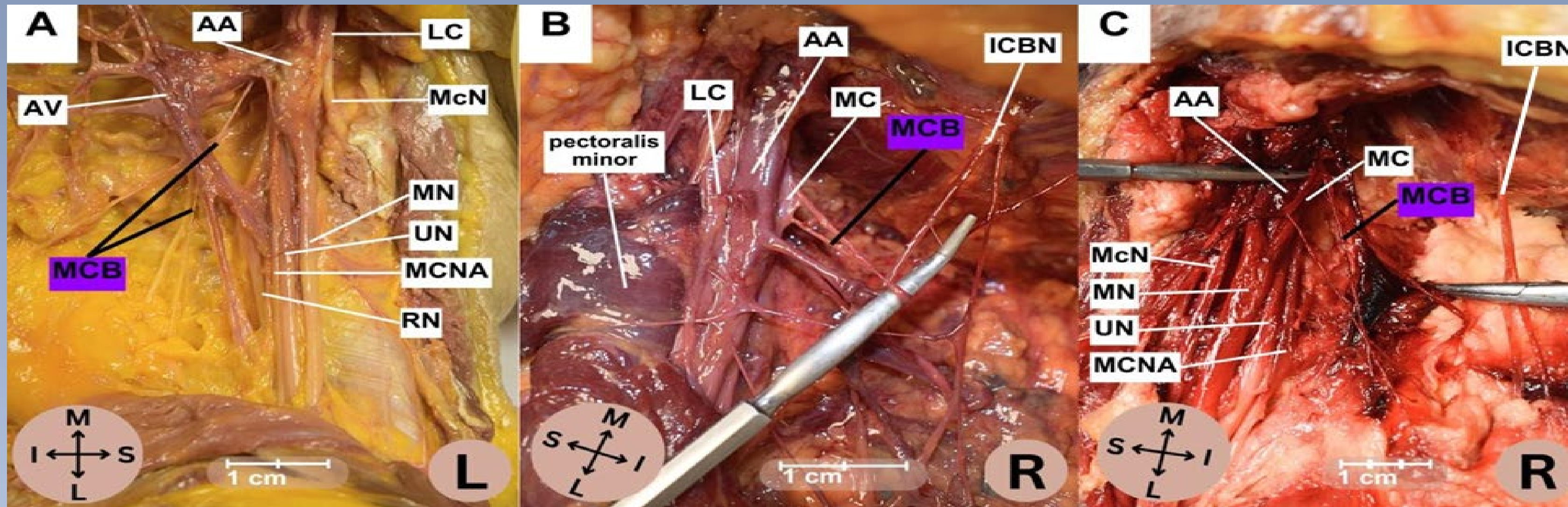
Intercostobrachial nerve distribution at Axilla



Posterior Cord branch distribution in axilla



Medical cord branch distribution in axilla



References

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Introduction

Female breast cancer is the most diagnosed cancer and the fifth leading cause of cancer death worldwide.

Approximately 60% of patients undergoing breast cancer surgery experience acute postoperative pain (APP) that is primarily localized to the axilla.

Postoperative analgesia is often managed with intraoperative peripheral nerve blocks (PNBs).

The PNBs typically administered in breast surgery target the intercostobrachial nerve (ICBN), which provides sensory innervation to the axilla.

Complete analgesia for axillary dissection with peripheral nerve blocks are not consistent or reliable.

Therefore, the incomplete coverage could be due to additional, undocumented innervation pathways.

Objective

The current study aims to expand sensory nerve identification via anatomical dissection of the axilla.

This will help us with better understanding of the neuronal supply of axilla and develop targeted peripheral nerve block.

Methods

Ethics Board approval of the Western University Office of Human Research Ethics (OHRE) CREB committee, (project id 121117) was obtained.

Axilla dissections were undertaken in donors sourced from Western University's body bequeathal program.

To maximize the quantity of donors that could be recruited, both soft-embalmed and fresh/frozen specimens were accepted.

Seven axillary dissections (3F, 4M) were performed with donors' supine and upper limbs abducted.

Incisions along the anterolateral thorax and superior clavicle created laterally reflecting skin flaps deep to pectoralis minor, allowing visualization of the ICBN and brachial plexus. Scaled photographic images were taken during dissections for documentation.

Result

In each dissection, an ICBN (100%, n=7) and a branch of the posterior cord (posterior cord branch: PCB; 100%, n=7) were identified entering axillary subcutaneous tissue.

In 57% of dissections (n=4), a branch of the medial cord (medial cord branch: MCB) was identified.

The upper & lower subscapular nerves and the thoracodorsal nerve were identified separately on the posterior cord, along with the medial pectoral nerve and medial cutaneous nerves of the arm & forearm on the medial cord, distinguishing the PCB and MCB as separate entities

Table 1. Summary of donor characteristics, sides available for dissection, and findings regarding axillary innervation.

	Donor 1	Donor 2		Donor 3		Donor 4		Donor 5	
Fixation	Soft-embalmed	Fresh/frozen		Fresh/frozen		Soft-embalmed		Fresh/frozen	
Sex	Female	Female		Male		Male		Female	
Side	Left (L) only	Left (L)	Right (R)	Left (L)	Right (R)	Left (L)	Right (R)	Left (L)	Right (R)
ICBN	Present; dual origin from 2 nd & 3 rd intercostal spaces	Present; from 2 nd intercostal space	Present; from 2 nd intercostal space & pierces pectoralis minor	2 present; one each from the 2 nd & 3 rd intercostal spaces	2 present; one each from the 2 nd & 3 rd intercostal spaces	Present; from 2 nd intercostal space	Present; from 2 nd intercostal space	Present; from 2 nd intercostal space	2 present; one each from the 2 nd & 3 rd intercostal spaces
Alternative Innervation	Branch of medial cord & branch of posterior cord	Branch of posterior cord	Branch of medial cord & branch of posterior cord	Branch of posterior cord	Branch of medial cord & branch of posterior cord	Branch of medial cord & branch of posterior cord	Branch of medial cord & branch of posterior cord	Branch of posterior cord	Branch of posterior cord

Conclusion

The current anatomical study will contribute to an overarching investigation to develop a novel approach to comprehensive regional analgesia for breast cancer surgery.

In addition to the ICBN, which has been previously documented as the source of axillary sensory innervation, two branches of the brachial plexus have been documented as entering the subcutaneous tissue of the axilla.

The PCB and MCB were determined to be novel, previously undocumented sensory branches arising from the brachial plexus.

In contrast to the anteriorly-distributed ICBN, the PCB is localized more posteriorly and has been identified in all cases, whereas the MCB is localized more centrally and has only been identified in 4 out of 7 cases.

The identification of these additional nerves supplying the axilla is crucial information when administering local anesthetic for breast & axillary procedures. Determining relevant landmarks for these nerves to be used under ultrasound, anesthesiologists will be able to administer local anesthetic, thereby fully anesthetizing the region.