



## Musculoskeletal Interventions Case Report

# Participatory action imaging in increasing clinician confidence of trigger point dry needling or trigger point injection of muscles requiring use of intercostal blocking: A case report

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## ABSTRACT

Some clinicians privately report a lack of confidence of being able to safely perform trigger point dry needling (TrPDN) or trigger point injection (TrPI) on muscles that require intercostal blocking, presumably resulting in procedural underutilization. Participatory action imaging (PAI), combined with procedural training and literature review of adverse event incidence, can be a useful tool in enhancing clinician confidence. A 6' 2", 185 lbs, 53-year-old male clinician subject with a latissimus dorsi trigger point (TrP) and privately reported high anxiety of performing TrPDN using the intercostal blocking technique, was examined to determine how clinician subject confidence could be improved through PAI and education regarding the degree of coverage of the intercostal space and rib during intercostal blocking. The clinician subject was placed in a left lateral decubitus position and rib imaged with a Siemens Acuson S2000 Ultrasound system with an 18L6 16 Hz high definition linear probe without intercostal blocking, and subsequently with intercostal blocking during maximal exhalation and inhalation, respectively. During intercostal blocking with maximal exhalation, the pleural space and an additional 13% of each side of the rib's superior and inferior borders were completely blocked by the examiner's fingers. During intercostal blocking with maximal inhalation, the pleural space and an additional 3% of each side of the rib's superior and inferior borders were completely blocked by the fingers of the clinician. On visual inspection and interpretation of the images (e.g., PAI), the clinician subject reported a "significant" decrease in self-reported anxiety in performing the intercostal blocking technique (STAI Y-1 score improvement to "low to no anxiety range"). While more study is needed to investigate how variation in patient anatomy (weight, height, and morphology), clinician anatomy (hand size), needle direction, and specific rib being used for influences patient safety, this case report presents PAI as a previously undescribed means for future research and clinician education regarding risk assessment of TrPDN or TrPI of muscles requiring intercostal blocking.

**Keywords:** Case report, Dry needling, Injection, Intercostal blocking, Trigger point

## INTRODUCTION

Intercostal blocking is a palpation and grip technique used for trunk muscles in a variety of therapeutic interventions including trigger point dry needling (TrPDN), trigger point injections

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(TrPI), and acupuncture. Described as securing the trigger point (TrP) between the index and middle fingers, wherein each finger is placed in the intercostal spaces adjacent to a rib upon which the TrP has been fixed,<sup>[1]</sup> this intercostal blocking is done in an effort to “block” the needle from unintentionally advancing into the intercostal space. In contrast to the intercostal blocking technique, blindly needling muscles of the trunk have been documented to result in potentially deadly iatrogenic complications.<sup>[2]</sup> This palpation and grip may be used when injecting or dry needling muscles such as the rhomboids, the serratus anterior, or (as was the focus of this case report) the inferior aspect of the latissimus dorsi. Although intercostal blocking is a well-established and accepted technique currently utilized and perpetuated in clinical training of doctors of physical therapy, doctors of chiropractic, and doctors of medicine, there is no known study that verifies effectiveness of this technique as protective of the intercostal space and pleura. Pneumothorax is a well-recognized (albeit rare) adverse event related to acupuncture or TrPDN over the thorax.<sup>[3-5]</sup> Despite the favorable safety profile, and despite a lack of literature on the subject, some dry needling clinicians (such as the clinician subject focus of this case report) privately confess to other certified dry needling clinicians and dry needling instructors, a lack of confidence in being able to safely perform TrPDN or TrPI on patients appropriate for receiving it, theoretically resulting in procedural underutilization.

Participatory action research (PAR),<sup>[6]</sup> a novel research tool that includes the subject as an active participant in the research process for the purposes of enhancing skill and confidence,<sup>[7]</sup> was used to educate the clinician subject on the procedural risks of intercostal blocking. Combined with pre-existing skill validation and certification, as well as pre-existing knowledge of the literature regarding incidence of iatrogenic injury from TrPDN or TrPI using intercostal blocking,<sup>[8,9]</sup> PAR in the form of visual observation of technique parameters (defined in this case report as “participatory action imaging” or PAI) proved a useful tool in enhancing clinician confidence.

## CASE REPORT

A 6' 2", 185 lbs., 53-year-old male clinician subject certified in dry needling with both right posterior/inferior scapular, anterior shoulder, and medial forearm pain; and subjective self-report of “high-anxiety” (objectively confirmed as “high anxiety”<sup>[10]</sup> by State Trait Anxiety Inventory for adults or STAI<sup>[11]</sup> form Y-1 score = 56) regarding performance of the intercostal blocking technique, was examined by a 5'5", 150 lbs., 47-year-old male doctor of physical therapy certified in both TrPDN and musculoskeletal ultrasound (MSKUS) to determine the degree of coverage of the intercostal space and rib during intercostal blocking. The STAI is a psychological inventory based on a 4-point Likert scale and consists of 40

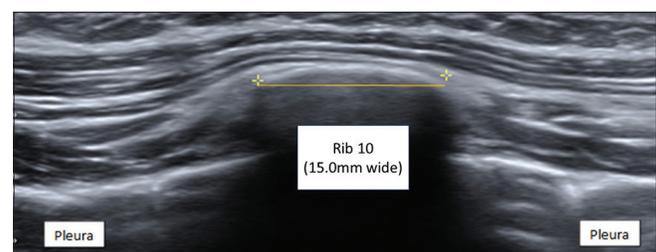
questions on a self-report basis. The STAI measures two types of anxiety. Form Y-1 measures state anxiety (anxiety about an event), and form Y-2 measures trait anxiety measures, or anxiety level as a personal characteristic.<sup>[11]</sup>

The clinician subject was placed in a left lateral decubitus (e.g. side lying on the left side, right side up, and exposed to the examiner) position and rib imaged with a Siemens Acuson S2000 Ultrasound system with an 18L6 16 Hz high definition linear probe with and without intercostal blocking. The linear width of rib 10 (defined as the superficial distance between the superior and inferior border) was measured at the mid-axillary line, with and without intercostal blocking (once with deep exhalation and once with deep inhalation). Rib 10 was selected for study secondary to the larger width of the rib relative to more superior ribs, as well as it being a common rib for intercostal blocking dry needling of the latissimus dorsi (the TrP referral pattern of which the clinician subject complained).<sup>[12]</sup>

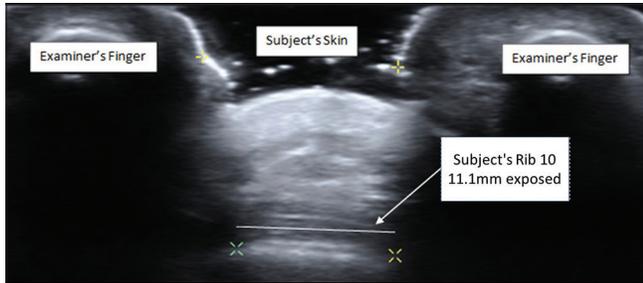
The width of the rib was measured as 15.0 mm [Figure 1]. During intercostal blocking with maximal exhalation, the pleural space and an additional 13% of each side of the rib's superior and inferior borders were completely blocked by the fingers of the examiner, leaving 11.1 mm, or 74% of the rib exposed [Figure 2]. Finally, during intercostal blocking with maximal inhalation, the pleural space and an additional 3% of each side of the rib's superior and inferior borders were still completely blocked by the fingers of the examiner, leaving 14.1 mm, or 94%, exposed [Figure 3]. On visual inspection and interpretation of the images with the examiner, the clinician subject reported a “significant” decrease in self-reported anxiety (objectively confirmed as “low to no anxiety” by STAI<sup>[10]</sup> form Y-1 score = 20) in performing the intercostal blocking technique, and an increase in self-reported subjective confidence with the technique.

## DISCUSSION

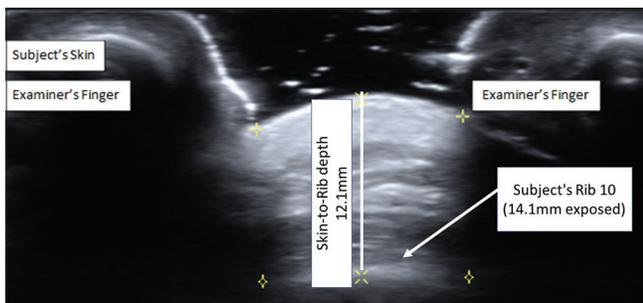
This case report presents a previously undescribed means for future research and clinician education regarding risk



**Figure 1:** Healthy 53-year-old male with right posterior/inferior scapular, anterior shoulder, and medial forearm pain; and self-report of high anxiety/low confidence regarding performance of the intercostal blocking technique. Musculoskeletal ultrasound imaging in short axis of right rib 10 imaged at mid-axillary line shows a normal, well-defined rib 15.0 mm wide.



**Figure 2:** Healthy 53-year-old male with right posterior/inferior scapular, anterior shoulder, and medial forearm pain; and self-report of high anxiety/low confidence regarding performance of the intercostal blocking technique. Musculoskeletal ultrasound imaging in short axis of right rib 10 during intercostal blocking and patient exhalation reveals intercostal space completely protected by examiner's fingers, in addition to 13% of either side of the rib (111 mm/150 mm = 74% of rib 10 exposed).



**Figure 3:** Healthy 53-year-old male with right posterior/inferior scapular, anterior shoulder, and medial forearm pain; and self-report of high anxiety/low confidence regarding performance of the intercostal blocking technique. Musculoskeletal ultrasound imaging in short axis of right rib 10 during intercostal blocking and patient inhalation reveals intercostal space completely protected by examiner's fingers, in addition to 6% of either side of the rib (141 mm/150 mm = 94% of rib 10 exposed).

assessment of TrPDN, TrPI, or acupuncture of muscles requiring intercostal blocking. Although not specific to TrPDN or TrPI, studies have shown that ultrasound imaging for procedural guidance enhances clinician skill and confidence.<sup>[13,14]</sup> Studies describing clinician safety and skill with the procedural aspects of TrPDN or TrPI have examined patient positioning,<sup>[15]</sup> accuracy of rib palpation,<sup>[16]</sup> and adverse event incidence,<sup>[3,17,18]</sup> but not intercostal blocking specifically. Recent study suggests that increased patient subject muscle mass is inversely proportional to examiner rib palpation accuracy, with the error rate rising as high as 26.7% with no correlation between examiner self-reported confidence and actual accuracy.<sup>[16]</sup> More study is needed to investigate how variation in patient (e.g., clinician subject) anatomy (e.g., rib morphology), examiner anatomy (e.g., finger size), needle direction, and specific rib being used for intercostal blocking influences patient safety. It is our hope

that future publications will use this PAI technique to further explore and compliment epidemiological studies concluding that needling of muscular TrPs, including into those muscles that require intercostal blocking, can be performed safely, with minimal risk<sup>[3,8,9,15]</sup> and with an acceptable level of confidence among properly trained professionals.

### Limitations

With respect to linear measurements such as tendon thickness, MSKUS was found to be reliable within and between operators, and between different machines with a standard error of measurement below 7% and a minimum detectable difference below 0.7 mm.<sup>[17]</sup> A possible limitation of this case report is the width of the clinician subject's rib 10 may be considered as little as 14.7 mm, with up to 14.8 mm of needle zone space accessible during intercostal blocking dry needling with maximal inhalation of the clinician subject. It should be noted that this 0.05 mm of unblocked intercostal space should still be considered 100% blocked during the clinical procedure of TrPDN or TrPI as this potentially unblocked intercostal space of 0.05 mm on either side of the rib should only occur during examiner set-up and hand placement with patient in maximal inhalation and not during the actual clinical procedure.

### Clinical impact

As performed by trained professionals on appropriate patients, TrPDN and TrPI requiring intercostal blocking are safe and effective techniques. Although more study is required to determine impact of variation of specific aspect of patient and clinician morphology (e.g., patient muscle mass, patient body type, size of examiner's hands, etc.) on both safety of technique and clinician confidence, a complete seal of the intercostal space was achieved by the examiner and viewed by the clinician subject through PAI with the intercostal blocking technique. Even during maximal clinician subject inhalation, the intercostal block was maintained, but safety may be maximized by first palpating with the patient in maximal inhalation and then administering the procedure in respiratory mid-range. In addition, although the theoretical risk of directing a needle toward a patient's rib and slipping between rib and examiner's finger into the intercostal space is exceedingly small, it was still within the measurement error of this study. Inserting the needle midway between the examiner's fingers at the distal interphalangeal joint at the center of the patient's rib and directing superficially (e.g., "shallow-deeper-deeper") toward the web space of the examiner's hand may, therefore, be a preferable needle direction when using intercostal blocking in terms of both procedural safety and clinician confidence with performing TrPDN or TrPI with intercostal blocking. As was demonstrated in this case report, PAI as an educational

tool may have a significant impact on clinician confidence in performing TrPDN and TrPI in instances where intercostal blocking is required. Ideally, this shift in clinician confidence should result in a decrease in privately self-reported under-utilization in intercostal blocking, and a more prevalent and judicious procedural utilization of the technique.

## CONCLUSION

PAI is a valuable tool in demonstrating low procedural risk to clinician subjects that perform TrPDN or TrPI in muscles that require the intercostal blocking technique. Future study is required to determine meaningful shifts in, and minimal standards of, clinician subject confidence for safe patient application of TrPDN or TrPI on muscles requiring intercostal blocking.

## Declaration of patient consent

Patient's consent not required as there are no patients in this study.

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Nil.

## Conflicts of interest

There are no conflicts of interest.

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