

Costotransverse block versus costotransverse foramen block: Long way to clarity on the difference in anatomy and techniques

Inter-transverse process (ITP) blocks were introduced to clinical practice a few years ago as an alternative or rather proxy to thoracic paravertebral blocks (TPVBs). It appears that ITP blocks would be more effective than the erector spinae plane block (ESPB) as the injectate is deposited closer to the paravertebral space in ITP blocks. However, due to the paucity of literature, we are not sure about this point. Moreover, ITP blocks did not get widespread acceptance, unlike the ESPB. Recently, I came across a case series of three patients for whom a bolus ITP block was provided, followed by a continuous ESPB for pain management during video-assisted thoroscopic surgery^[1] and commented on that article.^[2] My comments on that case series were about the difference between the techniques of various ITP blocks.^[2] However, I realized later that this topic requires further discussion.

First of all, we must note that the recent consensus statement (A Delphi study) on standardizing the nomenclatures of various regional techniques has collectively named the blocks such as mid-point transverse process to pleura (MTP) block, multiple-injection costotransverse block (MICB), costotransverse foramen block (CTFB), and sub-transverse process inter-ligamentary (STIL) block as “ITP” blocks.^[3] I would like to use the term “costotransverse block” (CTB) for MICB to make it simple and for the correct understanding of the technique *per se*. The term CTB was used previously by Aygun *et al.*^[4] as they provided a single-shot block, in contrast to the multiple-level injections advocated by Nielsen *et al.*,^[5] who described this technique first and named it “MICB”. The main purpose of this article is to clarify the difference between the two techniques, namely, the CTB and CTFB. The pictorial description is also provided for easy understanding [Figure 1].

I stated that I was not sure whether Yamamoto *et al.*^[1] provided CTFB for their first case in my comments.^[2] This was because the final needle position caused me confusion as it was placed neither at the lower part of the cranial transverse process (TP) as it should have been in case of CTFB^[6] nor over the neck of the rib attached to the caudad TP in case of a CTB.^[5] Moreover, initially, I misconstrued the comments of Nielsen *et al.*^[7] on the CTFB technique proposed by Shibata

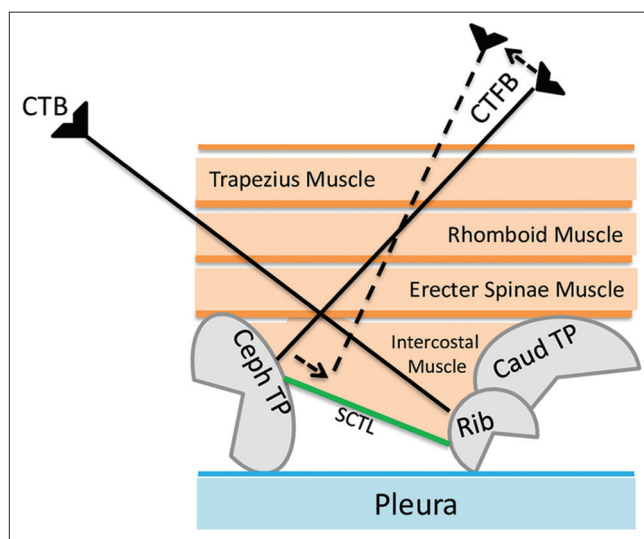


Figure 1: Needle trajectory of the CTB and CTFB. Regarding CTFB, the solid arrow indicates the usual trajectory, while the dashed arrow indicates the adjustment of the needle trajectory in case of spread of injectate in erector spinae plane instead of pleural displacement. Ceph TP = Cephalad Transverse Process, Caud TP = Caudad Transverse Process, SCTL = Superior costotransverse ligament

et al.^[6] Nielsen *et al.*^[7] stated “no novelty” in that technique as it is similar to the “STIL” block and only a “new name”, and the description has “many inaccuracies”. Hence, I misconceived that the term “CTFB” proposed by Shibata *et al.*^[6] itself was anatomically incorrect and, consequently, cast doubt about the correctness of the technique. However, upon careful analysis, I realized that CTFB can be considered as a different technique on both technical and anatomical aspects, as mentioned in the response letter^[8] to those comments.

Meanwhile, I came across another article in which it was mentioned that an ITP block (not specified) was used in patients undergoing breast reconstruction procedures.^[9] Interestingly, that study^[9] was conducted by the same authors, who originally described the CTB (named it MICB).^[5] Unfortunately, there was a discrepancy regarding the technique of the ITP block between the details provided in the trial registration and the published version,^[9] which compounded my confusion further. Nielsen *et al.*^[9] mentioned in their trial registration that the CTB would be provided at multiple levels in their study, in which case the needle

trajectory should have been from cranial to caudal, parallel to the superior costotransverse ligament (SCTL), and the final position of the needle should be over the neck of the rib attached to the caudad TP as per their previously published study describing that technique.^[5] However, Nielsen *et al.*^[9] presented the needle direction as “caudal to cranial” in the published version. Furthermore, the final needle placement was also away from the cranial TP,^[9] similar to the case description of Yamamoto *et al.*^[11]

My main concern is that these two techniques, namely, the CTB and CTFB, caused so much confusion for me, and I got clarity only after reading them extensively for a couple of days. Primarily, I greatly value and respect the comments of Nielsen *et al.*;^[7] as already mentioned, they only introduced the CTB in 2019^[5] and hence consider them pioneers of ITP blocks like Costache *et al.*,^[10] who suggested MTP block first in 2017. Indeed, their comments^[7] on the article of Shibata *et al.*^[6] that described the CTFB first in 2020 stimulated me to read the technique of CTFB in-depth, thus leading to clarity. Nielsen *et al.*^[7] stated that the CTFB technique described by Shibata *et al.*^[6] has a potential possibility of injuring the vessels and nerves during contact with the TP (i.e. cranial). However, I am not sure whether such complications can happen if one is carefully performing the block under ultrasound guidance. Importantly, Shibata *et al.*^[6] in their description of CTFB stated that although the initial needle placement would be at the lower part of the cranial TP, it could be moved slightly in the anterior and caudad direction so as to place it just behind the SCTL in the inter-transverse tissue complex with an aim to avoid an ESPB technically (if the displacement of erector spinae muscle occurs instead of the pleura [Figure 1]). This point only made me understand that it is possible to make the final needle placement away from the cranial TP while performing the CTFB, as it happened in the first case of Yamamoto *et al.*^[11] Similarly, I believe that Nielsen *et al.*^[9] also probably applied the CTFB and not CTB. It is intriguing that Nielsen *et al.*^[9] did not use multiple-injection CTBs as planned for their study, which was also described by them previously,^[5] and instead applied CTFB,^[6] on which they passed critique comments.^[7]

Regarding the spread of the injectate, a cadaveric study observed that both the costotransverse foramen (the medial slit of the SCTL) and the costotransverse space between the rib and the TP were potential pathways for the spread to the thoracic paravertebral space following the ultrasound-guided ITP block using 20 ml dye at T4-5 space. This study corroborates further that CTFB is anatomically different from CTB, as I mentioned earlier. Of note, this single-level injection resulted in a multi-level spread during cadaveric evaluation confirmed with three-dimensional micro-computed

tomography and histologic findings.^[11] We must note that cadaveric study has its own limitations and hence, clinical studies are warranted,^[12] although two studies comparing ITP blocks versus TPVB got published very recently.^[13,14] One study found that multi-injection ITP block (CTB) was non-inferior to multi-injection TPVB in major breast cancer surgeries,^[13] while another study observed that CTFB was non-inferior to TPVB in video-assisted thoracoscopic surgeries.^[14]

To summarize, many regional techniques have been introduced as ultrasound application has revolutionized regional anesthesia in the last decade. Indeed, too many techniques are described frequently, and it is difficult to understand the complete nuances of each technique. Also, the nomenclature compounds the problem further in some cases. The Delphi consensus study by the experts has certainly provided us with clarifications.^[3] Nevertheless, the consensus was weak regarding the ITP blocks.

To conclude, although the final needle position is in close proximity just behind the SCTL in CTB and CTFB, we are not sure whether they would exert similar clinical effects. Therefore, comparative studies involving the CTB and CTFB are warranted to understand their difference in clinical effects, ease of performance, complications, and so on. I believe that this is an interesting topic for further research.

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