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Radiofrequency Ablation of the Thoracic Descending Branch of the Posterior Rami: An Effective Intervention for Facet Joint Pain. A Case Report

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Background: Thoracic spine pain is believed to have a comparable prevalence to that of neck pain and low back pain in the general population. Recent discoveries in thoracic spine neuroanatomy have shown that the descending branch of the posterior ramus innervates the thoracic facet joint capsule. We present a case in which thermal radiofrequency ablation of the descending branch was used to significantly relieve pain in a patient with thoracic facet joint pain.

Case Report: A 57-year-old woman presented with a 4-month history of severe midthoracic back pain. The patient had failed initial conservative treatment including oral pain medications and physical therapy for 3 months. She ultimately elected for 2 bilateral diagnostic blocks of the T4-T6 descending branches and subsequent radiofrequency ablation; this treatment resulted in complete pain relief and functional improvement.

Conclusions: Thoracic spine descending branch thermal radiofrequency ablation may be a treatment option for thoracic facet joint pain.

Key words: Back pain, thoracic facet joint, descending branch, radiofrequency ablation, posterior ramus, thoracic spine, back, pain

BACKGROUND

Chronic back pain is a prevalent illness that causes significant physical debilitation and emotional burden on affected patients (1,2). Within the United States, it is estimated that one in 5 adults experience chronic back pain, while other countries may have a lifetime prevalence that ranges from 13% to 50% (3, 4). Among those with chronic back pain, thoracic spine pain is believed to have a lifetime prevalence of 12.0% to 31.2% in the general population (1).

While the pathophysiology of chronic thoracic back pain is multifactorial in origin and treatment often requires a multidisciplinary approach, prior studies have shown evidence that a major cause of pain in patients with chronic thoracic back pain originates from the thoracic facet joints (5). According to studies conducted

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by Manchukonda, et al (6) and Manchikanti, et al (7), the prevalence of thoracic facet joint pain in patients with chronic thoracic spinal pain ranges from 34% to 42%. While there is currently no evidence that thoracic facet joint pain can be diagnosed by clinical examination or medical imaging, administering a local anesthetic, such as lidocaine or bupivacaine, to the thoracic facet joint can help with diagnosing thoracic facet joint pain if the patient reports subsequent pain relief.

It is well understood that in the cervical and lumbar spine the facet joints are innervated by the medial branch (MB) of the dorsal rami (8,9). As such, the current standard of care for managing thoracic facet joint pain operates on the hypothesis that the thoracic MB may function as the afferent neuron of the joint (10,11).

According to the American Society of Interventional Pain Physicians' (ASIPP) 2020 guidelines for facet joint interventions, therapeutic MB blocks, thermal radiofrequency ablation (RFA), and intraarticular injections are the primary interventional treatment modalities for patients with thoracic facet joint pain (12). Nevertheless, the long-term effectiveness of these procedures have been highly scrutinized by researchers, with ASIPP giving weak to moderate strengths of recommendations to performing them on patients (10,12-14).

Thoracic MB RFA, reportedly the least evidence-supported intervention, has notably sparse literature addressing the long-term effectiveness in managing chronic thoracic facet joint pain (12). According to a recent systematic review and meta-analysis (15), evidence regarding the effectiveness of thoracic MB RFA is mixed, with a notable single high quality randomized control trial showing no significant pain relief after cooled RFA (16).

However, more recent studies have shown that in the thoracic spine, the facet joint capsule is innervated by the descending branch (DB), i.e., the first branch of the posterior ramus at the junction of the superior articular process (SAP) and transverse process (TP) (17-19). This discovery opens a new avenue for treating thoracic facet joint pain. We hypothesized that performing thermal RFA on the DB, rather than the classically taught MB, would provide thoracic facet joint pain relief. A recent anatomic-topographic investigation has further substantiated the understanding that RFA of the MB is ineffective in denervating the corresponding thoracic facet joint (18). Additionally, MB RFA has limited application at the T5-T8 levels since no bony landmarks are present that can be used to guide the RFA electrode given that the MB is located within the intertransverse space (20,21). Conversely, the DB lies within the junction of the SAP and TP at T5-T8, which are bony landmarks that can facilitate safe electrode placement (18).

In this case report, we describe performing DB RFA on a middle-aged patient who was resistant to conservative treatment of her thoracic back pain. We believe that this case will be the first to report the clinical feasibility of this technique for pain management.

CASE PRESENTATION

A 57-year-old woman presented with spontaneous, atraumatic, nonradiating midthoracic back pain that had worsened from 4/10 initially to 8/10 on the numeric rating scale over 4 months. She reported that her pain was worse at night, and it often woke her up from sleep. She additionally reported a significant decrease in function as she was not able to work as a full-time cleaner due to her pain. She had a past medical history of tobacco use disorder, well-controlled thyroid disease, and recent gastric surgery which resulted in an approximately 13.6 kg weight loss.

Her physical exam was notable for moderate tenderness to palpation over the bilateral paraspinal muscles from T4-T6. Otherwise, her musculoskeletal and neurological exams were unremarkable. Imaging studies included chest and thoracic spine x-rays followed by a computed tomography noncontrast medium chest scan, which revealed nonspecific spondylosis. A subsequent magnetic resonance image was also performed which did not show any new findings. Three months of conservative management with oral pain medications and physical therapy failed to improve her symptoms.

In July, 2020 our patient underwent a bilateral fluoroscopy-guided T4-T6 DB nerve block with 0.5 mL of 2% lidocaine. The patient reported significant pain relief which prompted a second nerve block with 0.5mL of 0.5% bupivacaine, performed 2 weeks later, which yielded more than an 80% temporary pain resolution.

Given her significant pain relief and no reported complications, she elected to undergo thermal RFA of the bilateral DB nerves of the posterior ramus. She first underwent thermal RFA of her right T4-T6 DB. The procedure was performed with the C-arm fluoroscope angled to square the targeted intervertebral disc space and rotated 15° ipsilaterally in order to visualize the junction of the ipsilateral SAP and TP.

A 16G 10.5 cm RFA electrode with a one cm curved active tip was inserted and directed to the junction with

the electrode tip resting on the SAP and posterior to the neuroforamen. RFA was performed at 85°C for 90 seconds. The patient tolerated the procedure well with no complications or new neurological signs or symptoms. The contralateral left T4-T6 DB thermal RFA was then performed using the same technique the following month, in August 2020, with no postprocedure concerns. During follow-up at one-week and one-month post her second RFA, our patient reported 100% pain relief.

She remained pain free for the next 6 months but returned to the pain clinic one year post her initial RFA due to the gradual recurrence of her thoracic pain that was, at worst, a 5/10 in intensity. A repeat RFA of the left T4-T6 DB was then performed utilizing a 16G 10.5 cm RFA electrode with a one cm curved active tip following the same parameters as the initial procedure. She tolerated the procedure well and reported no postprocedure concerns. She was followed-up at postprocedure one-week and reported 80% pain relief since the repeat thermal RFA. During her one-month and 2-month follow-up appointments, she reported no thoracic back pain (i.e. total pain relief).

Our patient followed-up at our pain clinic approximately 2 years later for an unrelated concern. She continued to report complete relief of her left- and right-sided thoracic back pain. She is currently working full time as a home maintenance worker and tolerates exertion and heavy lifting. She does not take any pain medications and has not needed to come back to our pain clinic for a recurrence of thoracic back pain.

DISCUSSION

Thoracic facet joint pain is a debilitating disease that is estimated to be present in 34% to 48% of people with chronic midback and/or upper back pain (22,23). While intraarticular facet joint steroid injections can serve as a relatively conservative intervention in treating refractory thoracic facet join pain, there is very limited data available in the medical literature on the outcomes of such injections (24). In a study conducted by Lee, et al (24), 40% of patients who received MB blocks and subsequent intraarticular thoracic facet joint dexamethasone injections reported pain relief of ≥ 50% at 6-months postprocedure. Similarly, in a retrospective study conducted by Gungor, et al (16) on cooled MB RFA to treat chronic thoracic facet joint pain, patients reported, on average, a 20.7% improvement in pain at 4 to 8 weeks, 53% improvement at 2 to 8 months, and 37% improvement at 6 to 12 months post-procedure. Additionally, 65% of the patients required a repeat MB RFA at 24 to 36 months postprocedure (16).

Ishizuka, et al (17) were able to identify that the posterior ramus of the thoracic nerve sends out the DB prior to bifurcating into the MB and lateral branch. In the same study, they concluded that the articular branch entering the thoracic facet joint originated from the DB (17).

The decision to perform a DB block, and subsequent RFA, on our patient was primarily driven by the variable results of pain outcomes post MB RFA and the addition to our increasing understanding of the neuroanatomy of the thoracic facet joint. We hypothesize that the variable results, low success rate, and short duration of relief following an MB RFA could possibly be due to the DB that innervates the thoracic facet joint is not targeted by the typical RFA technique. In order to further confirm that the DB is the only branch innervating a thoracic facet joint, further studies with larger sample sizes are needed to verify the pain generator in thoracic facet joint pain.

In order to determine whether it is the MB or the DB which predominantly carries pain signals from the thoracic facet joints, we suggest a randomized, controlled study that separately blocks the MB or the DB in patients with thoracic facet joint pain and subsequently injecting normal saline into the facet joint to provocatively generate pain.

Our case report adds to the small, but growing literature on DB RFA. Our patient reported significant pain reduction and subsequent pain elimination along with functional improvement without any significant complications. These findings provide optimism in the potential treatment of thoracic facet joint pain.

CONCLUSION

This is the first case report on thermal radiofrequency ablation of the DB of the posterior ramus in the thoracic spine that provided effective and long-term pain relief for thoracic facet joint pain. This novel approach should be studied further, ideally in a randomized fashion on a large patient population in order to confirm the clinical efficacy of this approach.

REFERENCES

1. Briggs AM, Smith AJ, Straker LM Bragge P. Thoracic spine pain in the general population: Prevalence, incidence and associated factors in children, adolescents and adults. A systematic review. *BMC Musculoskelet Disord* 2009; 10:77.
2. Froud R, Patterson S, Eldridge S, et al. A systematic review and meta-synthesis of the impact of low back pain on people's lives. *BMC Musculoskelet Disord* 2014; 15:50.
3. Yong RJ, Mullins PM, Bhattacharyya N. Prevalence of chronic pain among adults in the United States. *Pain* 2022; 163:e328-e332.
4. Mills SEE, Nicolson KP, Smith BH. Chronic pain: A review of its epidemiology and associated factors in population-based studies. *Br J Anaesth* 2019; 123:e273-e283.
5. Manchikanti L, Singh V, Pampati V, Beyer CD, Damron KS. Evaluation of the prevalence of facet joint pain in chronic thoracic pain. *Pain Physician* 2002: 5:354-359.
6. Manchukonda R, Manchikanti KN, Cash KA, Pampati V, Manchikanti L. Facet joint pain in chronic spinal pain: An evaluation of prevalence and false-positive rate of diagnostic blocks. *J Spinal Disorder Tech* 2007; 20:539-545.
7. Manchikanti L, Boswell MV, Singh V, Pampati V, Damron KS, Beyer CD. Prevalence of facet joint pain in chronic spinal pain of cervical, thoracic, and lumbar regions. *BMC Musculoskelet Disord* 2004; 5:15.
8. Büsken F, Lataster A, Herrler A. The innervation of the cervical facet joints-an anatomical and histological approach. *Clin Anat* 2022; 35:780–788.
9. Kapetanakis S, Gkantsinikoudis N. Anatomy of lumbar facet joint: A comprehensive review. *Folia Morphol (Warsz)* 2021; 80:799-805.
10. Manchikanti L, Singh V, Falco FJ, Cash KA, Pampati V, Fellows B. The role of thoracic medial branch blocks in managing chronic mid and upper back pain: a randomized, double-blind, active-control trial with a 2-year followup. *Anesthesiol Res Pract* 2012; 2012:585806.
11. Lee DW, Pritzlaff S, Jung MJ, et al. Latest Evidence-Based Application for Radiofrequency Neurotomy (LEARN): Best practice guidelines from the American Society of Pain and Neuroscience (ASPN). *J Pain Res* 2021; 14:2807-2831.
12. Manchikanti L, Kaye AD, Soin A, et al. Comprehensive evidence-based guidelines for facet joint interventions in the management of chronic spinal pain: American Society of Interventional Pain Physicians (ASIPP) Guidelines Facet Joint Interventions 2020 Guidelines. *Pain Physician* 2020;23:S1-S127.
13. Stolker RJ, Vervest AC, Groen GJ. Percutaneous facet denervation in chronic thoracic spinal pain. *Acta Neurochir (Wien)* 1993; 122:82-90.
14. Tzaan WC, Tasker RR. Percutaeous radiofrequency facet rhizotomy--experience with 118 procdedures and reappraisal of its value. *Can J Neurol Sci* 2000; 27:125-130.
15. Manchikanti L, Knezevic E, Knezevic NN, et al. Medial branch blocks and the effectiveness of radiofrequency neurotomy in managing chronic thoracic pain: A systematic review and meta-analysis. *Pain Physician* 2023; 26:413-435.
16. Gungor S, Candan B. The efficacy and safety of cooled-radiofrequency neurotomy in the treatment of chronic thoracic facet (zygapophyseal) joint pain: A retrospective study. *Medicine (Baltimore)* 2020; 99:e19711.
17. Ishizuka K, Sakai H, Tsuzuki N, Nagashima M. Topographic anatomy of the posterior ramus of thoracic spinal nerve and surrounding structures. *Spine (Phila Pa 1976)* 2012;37:E817-822.
18. Koutp A, Sadoghi P, Petritsch J, et al. Anatomic-topographic investigation of the branches of the dorsal ramus of thoracic spinal nerves. *Pain Med* 2022; 23:1869-1874.
19. Joshi A, Amrhein TJ, Holmes MA, Talsma J, Shonyo M, Taylor AB. The source and the course of the articular branches to the T4-T8 zygapophysial joints. *Pain Med* 2019; 20:2371-2376.
20. Chua WH, Bogduk N. The surgical anatomy of thoracic facet denervation. *Acta Neurochir (Wein)* 1995; 136:140-144.
21. Wong MJ, Rajarathinam M.. Ultrasound-guided axial facet joint interventions for chronic spinal pain: A narrative review. *Can J Pain* 2023; 7:2193617.
22. Atluri S, Datta S, Falco FJ, Lee M. Systematic review of diagnostic utility and therapeutic effectiveness of thoracic facet joint interventions. *Pain Physician* 2008; 11:611-629.
23. Gill B, Cheney C, Clements N, Przybsyz AG, McCormick ZL, Conger A. Radiofrequency ablation for zygapophyseal joint pain. *Phys Med Rehabil Clin N Am* 2022; 33:233-249.
24. Lee DG, Ahn SH, Cho YW, Do KH, Kwak SG, Chang MC. Comparison of intra-articular thoracic facet joint steroid injection and thoracic medial branch block for the management of thoracic facet joint pain. *Spine (Phila Pa 1976)* 2018; 43:76-80.