



Case report

Ultrasound-guided percutaneous laser cervical discectomy for intractable hiccups: A rare case report

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ABSTRACT

Background: Intractable hiccups serve no physiological purpose, but significantly reduce the quality of life. There are a variety of medications suggested for the treatment of persistent or intractable hiccups. However, it remains a great challenge for the management of intractable hiccups. In this case report, we describe the technique of percutaneous laser cervical discectomy under the sonographic guidance in treatment of intractable hiccups.

Case description: A 41-year-old male, who suffered intractable hiccups over 11 years, came to our pain department in December 2020. Neither oral medication nor phrenic nerve block achieved satisfactory relief of hiccups. Magnetic resonance imaging and computed tomography scan revealed cervical disc herniation of C4/5 and C5/6. Following selective cervical nerve root block, complete but short-term control of symptoms lasted less than 48 hours. Percutaneous laser cervical discectomy was then performed under ultrasound guidance and achieved complete and enduring symptomatic relief up to 14-month follow-up.

Conclusion: Cervical degenerative changes may be considered as potential cause for intractable hiccups, and ultrasound-guided percutaneous laser cervical discectomy may be used to treat hiccups caused by cervical discogenic etiology.

1. Introduction

Hiccups are familiar to all, however, when the hiccup becomes persistent or intractable, a terrible impact on life quality and mood may occur by interfering with daily activity [1]. The mechanism underlying this pathological reflex remains elusive; and one potential cause originates from the lesion of the upper cervical spine (C3–C5) [2]. Meanwhile, regional nerve block targeted at the cervical level has been demonstrated to be successful in the management of intractable hiccups [3]. Here, we report one novel surgical strategy of ultrasound-guided percutaneous laser cervical discectomy, which achieved immediate and sustained control of hiccups in a severe case who suffered the reflex disorder for more than 10 years.

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2. Case report

A 41-year-old male presented at our department in December of 2020, with an 11-year history of hiccups. The symptoms initially started from 2009 without any specific inducement. The onset of hiccups was intermittent with irregular episodes, ranging from several minutes to more than 10 days. Initial hospitalization and medical therapy achieved complete but temporary recovery, which only lasted for a few days. Patient suffered none underlying co-morbidity. Neither alcohol, smoking nor drug abuse was reported in this case. The patient can still participate in daily life at early stage of disease.

The symptom was continuous in the next three years. In 2011, the patient tried invasive therapy like phrenic nerve blocking, however, control of hiccups was obtained temporally. The symptom restarted within two days after the procedures. Following the successful but short-term nerve block, the continuous epidural anesthesia was then performed, and none recurrent hiccups were reported any more before discharge.

Unfortunately, the patient suffered recurrent hiccups in 2018 and gradually worsened in the frequency and duration, which became non-stop for days and continued during sleep before this hospitalization. The daily life of the patient was completely interrupted as the hiccups has become nearly non-stop, and the temporal relief of symptom was only achieved temporally by the repeated induction of vomiting reflex for more than 10 times per day. Countless medical examinations were performed, including repeated brain and cervical magnetic resonance imaging, abdominal and pulmonary computed tomography, and invasive gastrointestinal endoscopy, yielding none abnormal findings. Multiple medications were administrated including metoclopramide, omeprazole, lansoprazole, hydrocortisone, baclofen, gabapentin, pregabalin and duloxetine, in the absence of specific etiology.

Therefore, this patient was referred to our pain clinic for the treatment of the intractable hiccups in December 2020. The patient presented normal with physical and neurological examination, as well as laboratory results. The neck magnetic resonance imaging revealed slight cervical disc herniation at C4-7 level (Fig. 1a, b). Nevertheless, the patient did not complain any pain, weakness, numbness or tingling in the neck or upper extremity. Given the unsatisfactory control by non-invasive therapy, ultrasound-guided phrenic nerve blocking was initially applied. However, none significant improvement of hiccups was reported after nerve blocking treatment. Consequently, we performed selective cervical nerve pulsed radiofrequency and blocking at C3-5 level. Total relief of hiccups was achieved after the mini-invasive procedure, and the therapeutic effect lasted for 4 days. Following the successful but short-term neuromodulation therapy, the patient underwent the second procedure one week later. However, the patient continued to hiccup after the treatment. After careful consideration and review of the MRI, we suggested the patient to perform ultrasound-guided percutaneous laser cervical discectomy, due to the underlying discogenic cause. The patient consented to the procedure.

The hiccups were totally relieved after the mini-invasive surgery. We did not observe any obvious complications in this case. The

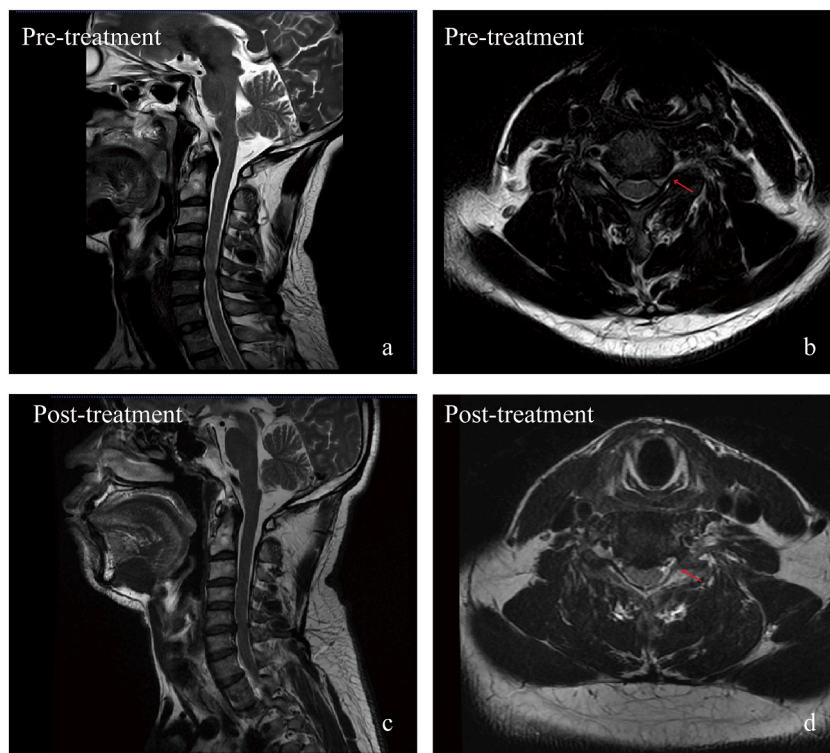


Fig. 1. Comparison of cervical disc herniation before (a, b) and after (c, d) percutaneous laser discectomy treatment. The red arrow indicates the location of disc herniation in the MRI. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

patient reported only occasional and short-lasting episodes, ranging between several seconds to minutes, with an average frequency less than 5 times per day. The hiccups can be terminated without any special intervention up to the 14-month follow-up. Postoperative MRI scanning was performed 12 months after discharge (Fig. 1c, d).

3. Operative technique

The detail of surgery was described as previously, Ref. [4] the patient was placed in a supine position under general anesthesia with intubation. The total duration of procedure was about one and half hour. After routine antiseptic operation, we performed the mini-invasive surgery under the guidance of one high-frequency liner probe (Fujifilm, SONOSITE, United States). One 19-G cannula with an internal mandrel was inserted into the targeted disc space with in-plane sonographic technique.

The first step of cervical structural identification was to search the of C7 transverse apophysis. We can easily distinguish the transverse apophysis of C7 due to its straight shape compared with other cervical level. We then gradually moved the ultrasonic probe head towards, and identified the characteristic U-type shape of C6 transverse apophysis. The cannulation was introduced under the real-time imaging guidance, which can help us avoid potential vessel injury. At this plane, the tip of needle can be guided to reach the anterior surface of C6 vertebral body, following which the cannulation was inserted into the C5/6 intervertebral disc space. We next scanned the fifth cervical nerve root, and the intertubercle sulcus became superficial and vertical at this level. This transition of intertubercle sulcus shape can be used to identify the corresponding cervical level, as shown in Fig. 2a–c.

When the cannula was inserted into the disc space and stable, one C-arm unit (TOSHIBA) was applied to guide the cannulation. The ending tip was placed at the distal third segment of disc according to the lateral fluoroscopic view, and slightly beyond the middle line in the anterior-posterior view respectively (Fig. 3a–d). An optic fiber was then inserted through the cannula to conduct the laser discectomy. The total amount of laser power was set 150 J for each disc during the first cycle, after which the tip of needle was pulled out at the middle of the intervertebral space for the second cycle of ablation.

4. Discussion

Cervical degenerative disc change is one of the most common diseases, even for the young population aged under 40 [5]. Despite

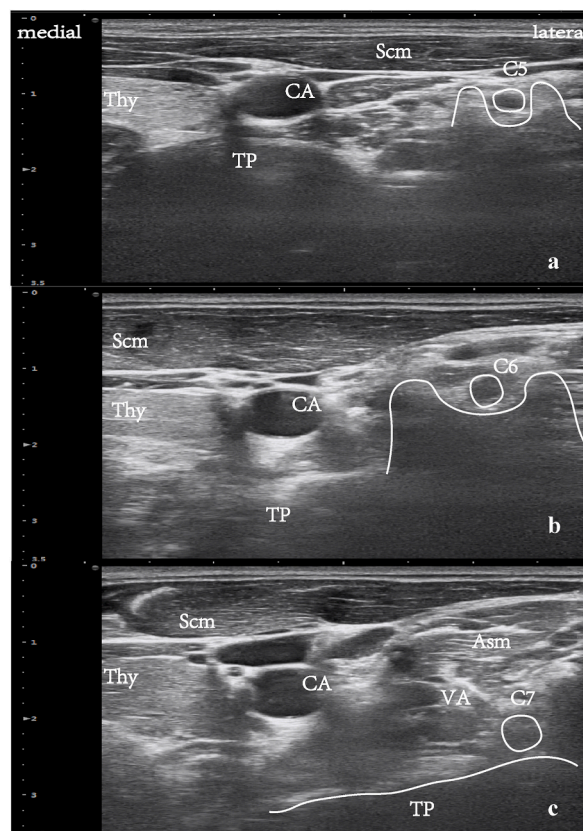


Fig. 2. Sonographic structures at distinct cervical level. (a) In-plane scanning of C7. (b) Identification of C6 level with great U-type shape of C6 transverse apophysis. (c) In-plane imaging of C5. Asm, anterior scalene muscle; Scm, sternocleidomastoid; Ca, carotid artery; Va, vertebral artery; TP, transverse process; Thy, thyroid; C5, fifth cervical nerve root; C6, sixth cervical nerve root; C7, seventh cervical nerve root.

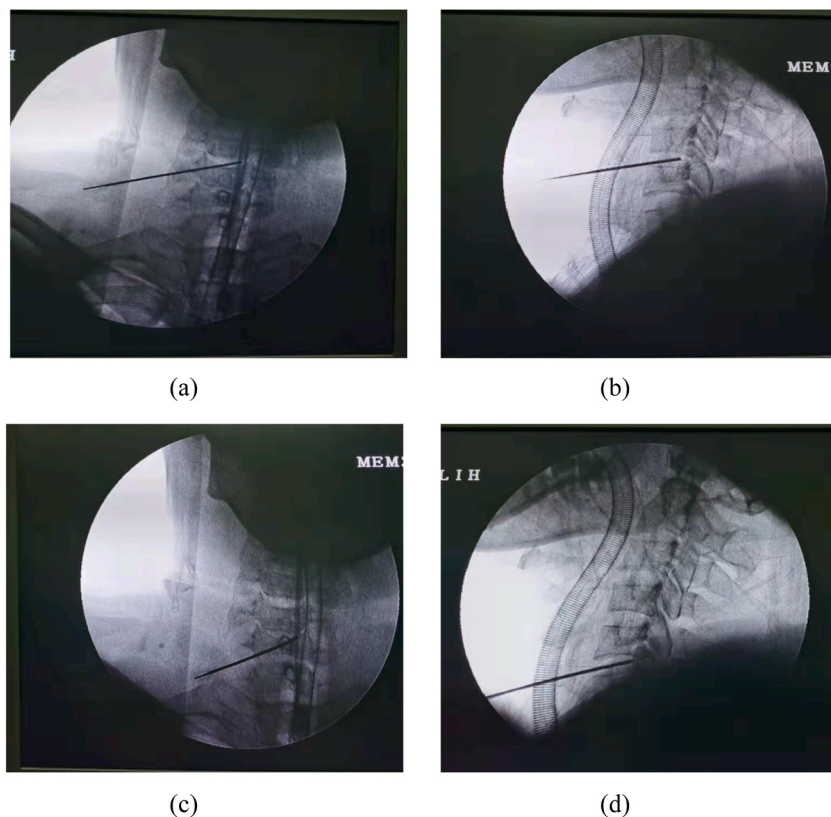


Fig. 3. Cannula placement confirmed by the fluoroscopic imaging. (a) The anterior-posterior and (b) lateral view of cannulation at C4/5-disc level, and the scan for the C5/6 intervertebral space respectively (c, d).

that intractable hiccup may be caused by the dysfunction of upper cervical spinal cord (C3–5 level) [2], the link between its mechanism and cervical discogenic disease remains much unknown. Here, we report one successful case treated by the ultrasound-guided percutaneous laser cervical discectomy, who suffered the pathological reflex over 10 years. This case may provide us one novel therapy strategy for the management of intractable hiccups.

The pathophysiology of intractable hiccups is generally divided into three components, the afferent limb traveling with phrenic, vagus and sympathetic nerves, the central connection and the efferent limb primarily traveling with the phrenic nerve to the diaphragm. Anything that irritates the afferent, efferent, or central processing area can result in hiccups [6]. In this case, the MRI indicated slight cervical disc herniation at C4–7 level, however, the patient did not present any typical radicular symptoms of cervical spondylosis, including neck or upper extremity pain, weakness or numbness. Conversely, these symptoms usually correlate with degenerative changes in the imaging testing. A key node of hiccup reflex arc is located in the anterior branch of the spinal root of C3–C5, which forms the afferent and efferent fiber of phrenic nerve. Thus, we assume that the compression of cervical spinal nerve root (C3–5 level) may partially contribute to the irritation of anterior branch, which may subsequently trigger the reflex of hiccups. However, the main limitation of this study is the lack of direct evidence between cervical disc herniation and pathological hiccup condition, as well as the small sample size of this treatment. We think it necessary to consider the potential role of anterior branch of the cervical spinal nerve root, selective nerve blocking may be useful before any further invasive procedure.

The fact that the continuous epidural anesthesia or selective cervical nerve root radiofrequency/blocking provided control of the hiccups, but not phrenic nerve blocking, also indicates that the disease may originate from the central processing region. Consistent with our finding, it has been demonstrated that cervical continuous epidural anesthesia may be an alternative option for intractable hiccups [3,7]. In addition to cervical degenerative disease, Hao et al. reported that cervical lesion caused by the inflammatory demyelinating myelitis may also lead the persistent condition of hiccups [8]. However, the management of the demyelinating neuropathy is totally different from cervical spinal spondylosis. In this case, we applied percutaneous discectomy for cervical disc herniation, which is consistent with treatment of radiculopathy for decompression of nerve root [9]. Symptomatic relief after decompression therapy may also indicate the potential role of cervical nerve branch in persistent hiccup conditions. In addition, general anesthesia may also influence the irregular hiccup reflex in this case, as neuromuscular-blocking agents was administrated to perform tracheal intubation. However, the long-term effect of anesthesia agents remains uncertain.

The conservative therapy remains the first option for cervical spondylosis, and surgical intervention can be considered for those with moderate to severe myelopathy [10]. Recently, we have demonstrated that percutaneous laser cervical discectomy achieved

enduring relief for radicular symptoms caused by the cervical disc degenerative disease [4]. In this case, the patient did not present typical radiculopathy, which indicated that the cervical nerve root may be not involved with the development of the intractable hiccups. Consequently, the patient only obtained limited relief from the hiccups with selective blocking of cervical nerve root. In addition to cervical radiculopathy, specific indication of the percutaneous technique includes soft, symptomatic contained cervical disc herniations [11]. Thus, we assume that the potential therapeutic effect of the procedure may be associated with the decompression of ventral root of cervical spinal cord, as shown in Fig. 1.

One obvious advantage of the percutaneous procedure is the reduction of structural damage. By introducing the ultrasound-guided technique, we can identify the specific landmark of the targeted intervertebral disc level. This plane can also be used to perform the selective cervical nerve blocking [12,13]. Moreover, the puncturing access can be designed to avoid the injury of vital vessels, including vertebral artery, internal jugular vein, and carotid artery. In our center, this minimally invasive surgery is usually performed under local anesthesia with slight sedative, to prevent the potential spinal cord injury during laser ablation [4]. For this patient, we chose general anesthesia to block the persistent hiccup condition, so that we can perform percutaneous puncture in the anterior region of neck. None obvious complications were observed in this case.

5. Conclusions

This case indicates the potential link between cervical degenerative changes and intractable hiccups. To our knowledge, little evidence supports the role of cervical degenerative diseases in the development of intractable hiccup. Here, we report one case of cervical spondylosis in which the patient suffered intractable hiccups for more than 10 years. The ultrasound-guided percutaneous laser cervical discectomy provided effective and enduring relief of hiccups up to 14 months after the procedure. Further study with large cohort size may be needed to confirm the therapeutic effect of this novel treatment. Also, we think it necessary to consider the role of cervical spinal nerve root and its anterior branch in the development of intractable hiccup condition.

Author contribution statement

All authors listed have significantly contributed to the investigation, development and writing of this article.

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Data availability statement

Data included in article/supplementary material/referenced in article.

Declaration of interest's statement

The authors declare no conflict of interest.

Additional information

No additional information is available for this paper.

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