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Almost slipped through the crack: Pediatric patient with bilateral slipped rib syndrome and twelfth rib syndrome of the eleventh ribs

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ABSTRACT

Slipped rib syndrome is a rare disorder in which there is hypermobility of the anterior false ribs, resulting in the tips of the ribs moving or slipping under the superior rib. Alternatively, twelfth rib syndrome is caused by irritation of the twelfth intercostal nerve related to the hypermobility of the twelfth rib.

In this report, we present a case of a 15-year-old male who presented with debilitating pain in the left posterior flank that persisted despite multiple medications and physical therapy. He was diagnosed with left-sided slipped rib syndrome and twelfth rib syndrome of the eleventh rib which was treated with eleventh rib excision. Less than one year later he developed right-sided pain and was ultimately diagnosed with right-sided slipped rib syndrome and twelfth rib syndrome of the eleventh rib for which he underwent right ninth and tenth costal cartilage excision and right eleventh rib excision. The patient then had complete resolution of his pain.

A delineation between slipped rib syndrome and twelfth rib syndrome is important since they are both relatively rare and often misdiagnosed. Our case report is significant since our patient had both of these rare diseases bilaterally which to our knowledge has not been previously published.

1. Introduction

Slipped rib syndrome (SRS) is a rare and painful disorder in which there is hypermobility of the anterior false ribs, ribs eight to ten, resulting in the tips of the ribs moving or slipping under the superior rib. SRS occurs when the false ribs lose their cartilaginous or fibrous attachment to one another, making them prone to misaligning and pinning under the adjacent ribs, irritating or impinging the intercostal nerve that is passing underneath the superior rib [1]. Although an exact etiology to this loss of cartilaginous or fibrous attachment is not apparent, risk factors to developing SRS have been thought to be related to overuse or direct trauma. Sudden extension or flexion, repeated one-sided weight bearing or exercise such as throwing a ball, vigorous swimming, or swinging a bat may be implicated [2]. Patients can present with a clicking or slipping sensation between their ribs, sharp and dull pain at the site that is possibly relieved with stretching or generalized upper abdominal pain [3].

Alternatively, twelfth rib syndrome is caused by irritation of the twelfth intercostal nerve related to the hypermobility of the twelfth rib lacking any bony attachments [4]. Similarly, hypermobility of the eleventh rib can cause the same phenomenon, termed twelfth rib syndrome of the eleventh rib. Pain from twelfth rib syndrome can be located more in the patient's back. Both are rare

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causes of chronic chest, back, abdominal or flank pain that may commonly go undiagnosed or misdiagnosed as many healthcare providers are unaware of such diagnoses [4]. A variety of positions may exacerbate or elicit the pain, including lateral flexion of the trunk, rising to a standing position, or rotation of the trunk [4]. Diagnosis of SRS can be done by performing the “hooking maneuver” on physical exam or by using dynamic ultrasound by experienced radiologist to visualize excessive movement of the affected rib tip [5,6].

In this report, we present a case of a 15-year-old male with a history of Tourette syndrome who presented with pain lasting for three months in the left posterior flank and was later diagnosed with both SRS as well as twelfth rib syndrome bilaterally. He underwent surgical management for both diagnoses which resulted in completed resolution of his symptoms.

2. Case presentation

A 15-year-old male with a history of Tourette syndrome who was experiencing approximately three months of left posterior flank pain that was not preceded by a traumatic injury. The pain was sharp, intermittent, and exacerbated by movement. It was noted that the patient had been swimming for the two weeks leading up to the onset of his pain. The pain was becoming debilitating and the patient was missing school and unable to play football during this time. His symptom onset was initially attributed to a kidney infection given the region of the pain and costovertebral tenderness on exam. However, the patient had undergone a renal ultrasound and urine analysis, both of which were negative. A CT scan of the abdomen and MRI of the chest had been performed and were negative for the presence of a neuroma, bony abnormalities, or other intraabdominal etiology. Physical therapy and osteopathic manipulative exercises were attempted with no relief of his pain. He had an ultrasound-guided regional anesthetic block and a fluoroscopy-guided transforaminal epidural steroid injection of the thoracic spine targeting the left T11 and T12 nerve roots performed, both of which provided less than one full day of pain relief. He had also attempted Tylenol, gabapentin, lidocaine patch, heat pack, and 10-day course of Prednisone, all of which were unsuccessful at relieving his pain. Given the initial improvement of symptoms with injection of local anesthetic and failed nonoperative management, the patient was referred to the pediatric surgery outpatient clinic for evaluation for SRS.

On physical exam, the patient had significant tenderness in the lower posterior aspect of his thorax, in approximately the tenth to twelfth rib region. Upon lateral palpation, there was tenderness on deep palpation of his lower ribs, including anterolateral area with increased tenderness in the posterior aspect. There was no tenderness on the right chest wall at this time. On the remainder of the patient's physical exam it was noted that he had hypermobility of many upper and lower extremity joints.

A dynamic ultrasound of the chest was obtained that did reveal abnormal movement of the left eleventh rib although the eleventh rib did not abut the twelfth rib. There was normal static and dynamic imaging of the left tenth rib and the right tenth to twelfth ribs. Given the patient's localized pain to the left eleventh rib and the increased mobility visualized on imaging, surgical excision of the eleventh rib was recommended. Neurolysis was provided as an alternative treatment but surgical excision was chosen by the patient and his family. Intraoperatively the patient was noted to have increased mobility of the left ninth to eleventh ribs. This was consistent with SRS and twelfth rib syndrome of the eleventh rib. Excision of the left eleventh rib with excision of the left ninth and tenth rib costal cartilage and cryoablation of the intercostal nerves for left ribs nine through twelve was ultimately performed. Post-operatively the patient experienced resolution of his left posterior flank pain. He did experience numbness initially at the left flank surgical incision site that improved over time.

The patient re-presented to the pediatric outpatient clinic approximately ten months after his initial procedure with similar symptoms on the right side. On exam he had tenderness at the subcostal region of right ribs nine and ten. He did try a local anesthetic injection which provided relief for a short period of time. Given his presentation, SRS was suspected and the patient was consented for surgical exploration and resection. The patient underwent excision of the right ninth and tenth costal cartilage and cryoablation of the right ninth and tenth intercostal nerves.

Fifteen months after his second operation he presented to the emergency department with worsening right-sided posterior rib pain that had been ongoing for several days. He had an ultrasound completed that revealed abutment of the right eleventh rib to the right tenth rib while sidebending to the right, consistent with twelfth rib syndrome of the eleventh rib. He underwent excision of the right eleventh rib and cryoablation of the right eleventh and twelfth intercostal nerves. Within four months of the last operation the patient was seen for a follow-up appointment and was pain free with no residual paresthesias.

To note, our patient was evaluated by a pediatric genetic specialist given his joint hypermobility seen on physical exam. It was determined that he did have generalized hypermobility of the joints but he did not meet criteria for hypermobile Ehlers-Danlos Syndrome or other connective tissue disorders such as Marfan syndrome or Loeys-Dietz syndrome.

3. Discussion

SRS has been described in the literature for many years but it is often not diagnosed given the relative rarity of the disease and the broad differential for generalized chest, abdomen, flank and back pain. Twelfth rib syndrome has been described in very few case reports with no clear consensus on diagnosis or treatment. We found no documented association between SRS and twelfth rib syndrome with hypermobility of joints or connective tissue disorders.

Classically, the diagnosis of SRS is based on clinical exam and can be confirmed with an exam technique termed the “hooking maneuver.” This maneuver involves the curling of the physician's fingers beneath the costal margin, and then initiating an upward lift [5]. If this reproduces the sharp pain caused by SRS, or if there is a “clicking” sound produced, it is deemed a positive test and is highly indicative of SRS [5,7]. On the other hand, diagnosis of twelfth rib syndrome is also clinical and is usually a diagnosis of exclusion [8]. The patient typically has tenderness with palpation over the tip of the eleventh or twelfth rib. The “hooking” maneuver is not

used for diagnosis because it would not reproduce the pain in twelfth rib syndrome as the eleventh and twelfth ribs do not attach anteriorly to the costal cartilage [4].

The current literature is sparse in regards to imaging modalities for SRS. Static imaging with radiographs, CT, and MRI may demonstrate grossly abnormal ribs but there is no literature describing any successful utilization of these modalities in the diagnosis of SRS [6]. Few studies have described and shown success with dynamic ultrasound as a useful tool to aid in the diagnosis of SRS, as demonstrated in our case. Van Tassel et al. found that dynamic ultrasound imaging of the ribs, particularly with utilization of crunch and rib push maneuvers, correctly detected the presence of SRS in 89% of cases and detected its absence in 100% of cases [6].

For patients with SRS that present with mild symptoms, reassurance and conservative measures are initially used. Patients are informed to avoid specific movements or postures that may trigger the pain. Nerve blocks may be performed in refractory or more severe cases [3]. Similarly, twelfth rib syndrome is usually conservatively treated with heat packs, ice packs, and over-the-counter analgesic medication. Cryotherapy applied to the twelfth intercostal nerve is also a conservative option that may be used. However, for cases that are refractory to conservative treatment, minimally invasive management such as an intercostal nerve block to the affected rib tip may be needed to resolve the pain. Subsequently, surgical management is required if the pain returns despite an intercostal nerve block, where the affected rib is excised [4]. Cryoablation of the affected intercostal nerves can also be added for additional pain relief. Nonexcisional surgical repair with rib fixation to restore the normal rib anatomy has been performed with positive results in the adult population but has not been trialed with children [9].

4. Conclusion

SRS and twelfth rib syndrome are rare causes of chest, abdomen, flank, and back pain. Providers should be aware of these syndromes to avoid unnecessary studies and long term pain for these patients. Resection of the affected rib and costal cartilage in combination with cryoablation of the affected intercostal nerve is a safe and effective treatment.

Patient consent

Consent to publish the case report was not obtained. This report does not contain any personal information that could lead to the identification of the patient.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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