

## Clinical Note

# The Twelfth Rib Syndrome

Karen A. W. Cranfield, MBBS, FRCA, Robert J. Buist, BA, MBBS, FRCA,  
Paul R. Nandi, MBBS, MRCP, FRCA, and Andrew P. Baranowski, Bsc (hons),  
MBBS, MD, FRCA

*Department of Anaesthetics (K.A.W.C., A.P.B.), University College London Hospitals, and  
Department of Anaesthetics (P.R.N.), National Hospital for Neurology and Neurosurgery,  
London, and Department of Anaesthetics (R.J.B.), Medway Hospital, Gillingham, Kent,  
United Kingdom*

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### Abstract

*The twelfth rib syndrome appears to be a fairly common and underdiagnosed chronic pain syndrome. It is more common in women than men (3:1) and is usually described as a constant dull ache or sharp stabbing pain that may last from several hours to many weeks. Lateral flexion, rotation of the trunk, and rising from a sitting position classically aggravate the pain. Manipulation of the affected rib and its costal cartilage reproduces it exactly. The diagnosis of this syndrome is clinical, requires exclusion of specific etiologies, and should only be made when the patient's symptoms can be exactly reproduced by manipulation of the affected rib. If symptomatology is complicated, it may be necessary to use an image intensifier for accurate location of the pain locus. Patients with this syndrome can be overinvestigated and have even undergone surgical procedures when this diagnosis has been overlooked. To describe the varied presentation of this syndrome, we describe the clinical manifestations in six patients. J Pain Symptom Manage 1997;13:172-175. © U.S. Cancer Pain Relief Committee, 1997.*

### Key Words

*Twelfth rib, intercostal block, loin pain*

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## Introduction

The twelfth rib syndrome is associated with chronic pain in the loin, sometimes with acute exacerbations and radiation to the groin. It can also be a cause of chest pain. The syndrome is presumed to arise as a result of irritation of the twelfth intercostal nerve by the highly mobile twelfth rib, which does not have

any lateral bony attachments.<sup>1-5</sup> A similar pain is also thought to occur as a result of irritation of the eleventh intercostal nerve by the eleventh rib.<sup>5</sup>

Despite sporadic reports of the twelfth rib syndrome since 1962, the diagnosis is often overlooked. We describe six patients with the twelfth rib syndrome who presented within a 2-year period. The diagnosis had not been made prior to our consultation. These cases illustrate the value of a diagnostic sign, pain reproduced by pressure over the eleventh and/or twelfth ribs, and confirm that the symptoms, other signs, and outcomes of these patients are very variable.

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*Address reprint requests to:* Andrew Baranowski, MD, MBBS, FRCA, Non-Acute Pain Management, University College London Hospitals, The Middlesex Hospital, Mortimer Street, London W1N 8AA, United Kingdom.

*Accepted for publication:* June 12, 1996.

## Case Reports

### Case 1

A 66-year-old man presented with an 8-month history of low left-sided chest pain, radiating to the abdomen. There was no history of trauma. The pain was a constant dull ache, which varied in severity. It was aggravated by extension of the spine and by direct pressure over the back at the level of the lower thoracic vertebrae, as might occur during sitting. Flexion helped to relieve the constant ache, but not the acute exacerbations. There was no sensory deficit.

He had been investigated by several specialists. All investigations, including radiographs and gastroscopy, were negative. He had been given nonsteroidal anti-inflammatory drugs, simple analgesics, and buprenorphine, none of which produced any relief.

On examination, the most significant sign was the reproduction of his pain by pressure over the eleventh and twelfth ribs. This was confirmed by an examination under an image intensifier. Bone scans were normal.

The pain was relieved completely following T 11 and T 12 intercostal nerve blocks. The analgesia persisted for a time consistent with the expected duration of the local anesthetic. Successive blocks failed to prolong the duration of analgesia. Augmentation of pain relief was not achieved with transcutaneous nerve stimulation or with amitriptyline 50 mg daily. Intercostal cryotherapy provided minimal relief, despite evidence of axonotemesis. Surgical removal of the two lower ribs resulted in complete relief of his pain, which has continued over the last year.

### Case 2

A 48-year-old woman was referred for evaluation of longstanding back pain. Despite having had back pain for years, she had noted that 2 years before referral, the nature of the pain had changed. She complained of a dull constant pain in the right loin and right costal margin, which was constant but varying in its severity. This pain had no associated paresthesia or allodynia, and was aggravated by extension of the spine and by pressure over the mid-lumbar region. Manipulations by physiotherapists and osteopaths had made the pain worse.

Tenderness over the twelfth rib was elicited during examination and confirmed to be the source of the pain under an image intensifier. This pain was completely relieved following two intercostal injections of local anesthetic (5 mL 0.5% bupivacaine) and steroid (methylprednisolone acetate 40 mg). However, the chronic low back pain continued.

### Case 3

A 22-year-old woman was referred for treatment of right costovertebral angle tenderness. She described a 4.5-year history of an intermittent, sharp pain in the right loin, which commenced during a pregnancy. She had exacerbations of the pain every few months, and, on each occasion, the pain lasted for 2 weeks. There was no paresthesia or allodynia. The pain was relieved by lying flat, by the use of a hot water bottle, or by various simple analgesics. Her appetite and sleep were adversely affected by the pain.

Various investigations, including abdominal radiographs, renal ultrasound, and an intravenous pyelogram, had all been normal. On examination, the only abnormal finding was extreme tenderness inferior to the twelfth rib on the right side. This was associated with paravertebral muscle spasm.

Treatment was commenced initially with transcutaneous electrical nerve stimulation, which was moderately successful. She subsequently required a twelfth intercostal nerve block, which was performed under an image intensifier, with bupivacaine 0.5% (10 mL) and methylprednisolone (80 mg). She was reviewed 1 month later in the outpatient department. Her symptoms had improved markedly, although the maximum improvement was not apparent until 2 weeks after the injection. She no longer required analgesics, and was able to be more physically active without inducing the pain.

### Case 4

A 39-year-old woman was referred with the presumptive diagnosis of left-sided sciatica thought to be secondary to arachnoiditis. She had suffered several subarachnoid and intervertebral hemorrhages secondary to a left parietal arteriovenous malformation. Her pain was in the region of the left loin, and it was deep, boring and constant. She had acute

exacerbations associated with sitting, leaning forward, and lying on soft surfaces. Diclofenac and codydramol reduced her symptoms, but she had to spend 9 hr a day lying down. There were no associated sensory symptoms. On examination, she had a mild right hemiparesis, dysphasia, and tenderness over the course of the left twelfth rib.

Examination under an image intensifier, reproduced the loin pain when pressure was applied to the twelfth rib. A twelfth intercostal nerve block was performed using 5 mL of 2% lidocaine. This relieved the loin pain for the duration of the anesthetic. The block was subsequently repeated with 0.5% bupivacaine (8 mL) and methylprednisolone (80 mg). Again, the pain was relieved for the duration of the bupivacaine. The patient then underwent cryotherapy of the twelfth intercostal nerve. She was pain free on subsequent follow up visit, 6 months later.

#### Case 5

A 70-year-old woman was referred with pain in the right loin thought to be secondary to arachnoiditis following spinal surgery in 1970. Ten years after her surgery, she had developed lower limb pain, that was successfully treated by insertion of a dorsal column stimulator. This had progressively failed to control her limb pain and a new pain in the right loin had subsequently developed. This was a deep ache with sudden exacerbations, particularly on right lateral flexion of the lumbar spine. There was no associated sensory deficit.

On examination, she was found to be tender in the right loin, and under the image intensifier, direct pressure on the twelfth rib reproduced the loin pain. An intercostal block with 2% lidocaine (5 mL), relieved the pain, and a subsequent course of intercostal blocks using bupivacaine and methylprednisolone reduced the loin pain. At a 6-month follow-up appointment, the loin pain had resolved, but her lower limb pain persisted and was refractory to treatment.

#### Case 6

A 41-year-old man, known to have Peutz Jaeger syndrome, presented with a 17-month history of right-sided sub-costal pain. This had developed following a laparotomy, and seemed to be related to posture. He had no

sensory symptoms, and pressure over the anterior region of the twelfth rib resulted in production of the pain. He was noted to have excessively long lower ribs on a chest radiograph.

On examination under an image intensifier, the pain was primarily localised to be arising from the twelfth rib. Local anesthetic and steroid injection into the costovertebral complex, and as an intercostal nerve block, gave relief of his symptoms for the duration of the local anesthetic. A subsequent intercostal nerve block was not successful, but the patient is obtaining considerable relief with the use of a transcutaneous nerve stimulator.

### Discussion

These cases illustrate several variants of the classical presentation of the twelfth rib syndrome. This variation may give some insight into the possible pathogenic mechanisms.

The twelfth rib syndrome has also been described as clicking rib syndrome and rib tip syndrome, and is more common in women.<sup>7</sup> The age range of this condition is 15–60 years. Classically, lateral flexion and rotation of the trunk aggravate the pain. Rising from a sitting position is often extremely painful. Patients can become anxious and depressed and restrict their physical activities in order to prevent the pain. Although some cases may resolve without treatment, patients can be misdiagnosed and undergo unnecessary investigations or even surgical procedures.

Case 1 illustrates the classical presentation and outcome of these patients.<sup>1</sup> The pain was constant, radiated into the abdomen, and was exacerbated by sitting or other activities that involved extension of the spine. The diagnosis was suggested by examination in the clinic, and confirmed by the production of pain on movement of the twelfth rib under radiograph guidance. An intercostal nerve block with local anesthetic relieved the pain, and permanent relief of symptoms was achieved after resection of the twelfth rib. This is the only treatment suggested in the data available at this time to provide long-term analgesia for these patients.<sup>2,6</sup>

The syndrome is thought to arise from irritation of the intercostal nerve by the adjacent hypermobile rib cartilage. The complicated

distribution of the nerve and its branches explains the variation in sites of pain. The twelfth rib is much shorter than the eleventh, and its vertebral end is directed slightly upward. It has a single articular facet on the head, without a tubercle or neck. Despite being a short rib, numerous structures are attached, including quadratus lumborum, the costodiaphragmatic recess of the pleura, the lumbocostal ligament, the lowest levator costae, longissimus thoracis, iliocostalis, serratus posterior inferior, latissimus dorsi, and the external oblique muscle. Along the upper border is the insertion of the external intercostal muscle.<sup>8</sup>

The anatomy of twelfth intercostal nerve can explain the variability in pain referral.<sup>2</sup> The ventral ramus is larger than that of the other intercostal nerves, and gives a communicating branch to the first lumbar nerve. It gives off an early collateral branch. The nerve is closely related to the subcostal artery traveling along the lower border of the twelfth rib, and passes behind the lumbocostal arch. It then travels behind the kidney, in front of the quadratus lumborum, perforates the aponeurosis of transversus abdominis, passing between that muscle and the obliquus internus to be distributed in the same manner as the other lower intercostal nerves. It communicates with the iliohypogastric nerve and gives a branch to the pyramidalis. The lateral cutaneous branch passes through the internal and external oblique muscles, supplying the lowest part of the latter, descends over the iliac crest behind the anterior superior iliac spine, and has branches to the skin in the front part of the gluteal region with some branches supplying the greater trochanter of the femur.

As illustrated by our cases, the twelfth rib syndrome varies in presentation and course. Some patients respond well to simple intercostal nerve blocks, whereas others require costo-

vertebral blocks. Occasionally, we have had patients with the syndrome who have had effective long term analgesia following epidural administration.

The variation in the syndrome suggests that the causation is multifactorial. This condition is fairly common and needs to be remembered as a possible cause of visceral and loin pain. It is, in part, a diagnosis of exclusion and requires evaluation of a differential diagnosis that includes biliary tract pathology, peptic ulceration, and renal pathology. A diagnosis can be made simply in a clinical setting by direct examination, and confirmed with the use of an image intensifier. The image intensifier can also be used to assist the accurate placement of local anesthetic blocks. Rapid diagnosis and treatment can markedly improve a patient's quality of life.

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