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Jin-Lei Wang, Director
Xiu-Xia Song, Vice Director
World Journal of Clinical Cases
Room 903, Building D, Ocean International Center,
No. 62 Dongsihuan Zhonglu, Chaoyang District,
Beijing 100025, China
Telephone: +86-10-85381891
Fax: +86-10-85381893
E-mail: bpgoffice@wjgnet.com
http://www.wjgnet.com

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E-mail: bpgoffice@wjgnet.com
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MINIREVIEWS

Unilateral peripheral neuropathic pain: The role of neurodiagnostic skin biopsy

Michelangelo Buonocore

Michelangelo Buonocore, Unit of Clinical Neurophysiology and Neurodiagnostic Skin Biopsy, Fondazione Salvatore Maugeri, Scientific Institute of Pavia, 27100 Pavia, Italy
Author contributions: Buonocore M contributed to the manuscript.
Correspondence to: Michelangelo Buonocore, MD, Clinical Neurophysiology Unit, "Salvatore Maugeri" Foundation-Scientific Institute of Pavia, Via Maugeri 10, 27100 Pavia, Italy. michelangelo.buonocore@fsm.it
Telephone: +39-382-592392 Fax: +39-382-592020
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Abstract

According to the current definition of neuropathic pain ("pain arising as a direct consequence of a lesion or disease affecting the somatosensory system"), the demonstration of a lesion or disease involving the somatosensory system is mandatory for the diagnosis of definite neuropathic pain. Although several methods are currently available for this aim, none is suitable for every type of disease (or lesion). Neurodiagnostic skin biopsy (NSB) is a relatively new technique for the diagnosis of peripheral nerve lesions. It is an objective method, completely independent from the patient's complaining, based on immunohistochemical staining techniques that allow measurement of the density of the epidermal nerve fibers, currently considered the free nerve endings of small diameter (A-delta and C) afferent fibers. NSB has the important property of being used to investigate the skin, allowing obtaining a diagnosis of small fiber axonal neuropathy of peripheral nerves supplying every body part covered by skin. This feature appears to be very important, particularly in cases of unilateral nerve lesions, because it allows going beyond the possibilities of neurophysiological tests which are available only for a limited number of peripheral nerves. All these characteristics make NSB a precious instrument for the diagnosis of peripheral unilateral neuropathic pain.

Key words: Skin biopsy; Neuropathic pain; Diagnosis; Peripheral nerve lesion; Innervation

Core tip: The demonstration of a lesion or disease involving the somatosensory system is mandatory for the diagnosis of definite neuropathic pain. Unfortunately, none of the currently available methods is suitable for every type of nerve lesion. Neurodiagnostic skin biopsy (NSB) is an objective method to measure the density of epidermal sensory small fibers. In case of unilateral nerve lesions, it goes beyond the diagnostic possibilities of neurophysiological tests, allowing the diagnosis of axonal neuropathies of peripheral nerves supplying every body part covered by skin. For these reasons, NSB represents a precious tool for the diagnosis of peripheral unilateral neuropathic pain.

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UNILATERAL NEUROPATHIC PAIN

In 2008, the special interest group for neuropathic pain of the International Association for the Study of Pain (IASP) proposed a new definition of neuropathic pain: "pain arising as a direct consequence of a lesion or disease affecting the somatosensory system"[1]. This new definition was accepted by the IASP and is now largely used all over the world. According to it, neuropathic pain conditions have several possible mechanisms which ex-

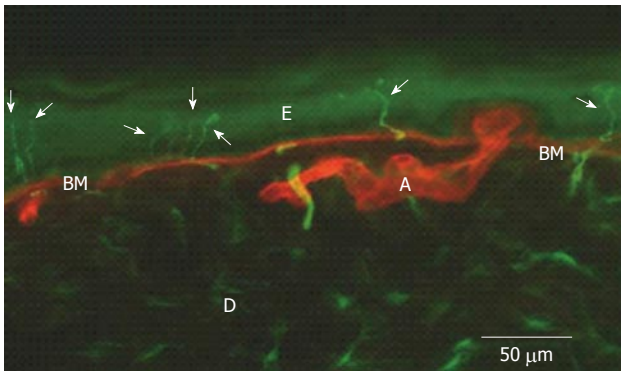

Figure 1 Epidermal nerve fibers (arrows) identified by immunofluorescence in the distal leg of a normal subject (in green, PGP 9.5 staining of nerve fibers; in red, type Ⅳ collagen staining of basement membrane and blood vessels). E: Epidermis; D: Dermis; BM: Basement Membrane; A: Artery.

press different phenotypes and clinical presentations. On this basis, neuropathic pain has to be divided into at least central and peripheral neuropathic pain, depending on which part of the nervous system is involved. Peripheral neuropathic pain is sustained by peripheral nerve lesions that can have various types of presentation[2]. In particular, among the multiform pathophysiological expressions, one of the main differences is based on symmetrical or asymmetrical pathology sustaining the painful clinical syndromes. Nerve lesions associated with neuropathic pain can indeed be symmetrical, *e.g.*, polyneuropathies, or asymmetrical, *e.g.*, herpes zoster neuropathy. Although there are well-documented contralateral effects following a painful lesion[3], only asymmetrical nerve lesions sustain the so-called unilateral neuropathic pain.

Several forms of unilateral peripheral nerve lesions are possible[2,4]. They can be roughly divided into mononeuropathies, radiculopathies and plexopathies. The most common clinical presentation is mononeuropathy, *i.e.*, a lesion involving only one peripheral nerve, such as the median nerve lesion in the carpal tunnel syndrome. Another common clinical presentation of unilateral peripheral nerve lesion is radiculopathy, a frequent consequence of an intervertebral disk herniation or other pathologies of the lumbar or cervical spine. Plexopathies are rarer than other unilateral nerve lesions, the most frequent being brachial plexopathy, commonly caused by trauma or disorders involving neighboring structures.

CLINICAL NEUROPHYSIOLOGICAL TESTS FOR THE DIAGNOSIS OF UNILATERAL PERIPHERAL NERVE LESIONS

In cases of suspected peripheral unilateral neuropathic pain, in order to demonstrate the presence of a peripheral nerve lesion sustaining the painful condition, the first diagnostic step following the clinical examination is usually the execution of neurophysiological tests, in particular electromyography (EMG) and electroneurography (ENG or nerve conduction studies)[5-8]. Unfortunately, those tests have two major limitations. The first is the impossibility of using them in every part of the body (*e.g.*, the trunk) and the second is the fact that they investigate only large diameter fiber functions, part of the lemniscal system which is only one of the two tracts of the somatosensory system, the lesion (or disease) of which is mandatory for the diagnosis of neuropathic pain[1]. Another possible tool to test the function of peripheral large diameter/lemniscal fibers are somatosensory evoked potentials[7,9,10] that can be useful to study the proximal parts of the peripheral nervous system, but substantially share the same limitations of EMG and ENG. The small diameter fibers' functions can be neurophysiologically investigated by Laser Evoked Potentials[10-12], although this test is still confined to specialized neurophysiological labs, is time consuming and currently is not used for routine diagnostic evaluation.

Finally, another test for evaluating small fiber afferent function is Quantitative Sensory Testing[13-15]. The controlled application of thermal stimuli indeed allows investigating the spinothalamic functions, both in its A-delta (cold stimuli) and C component (warm stimuli). The major limit of this method is the necessity for the patient's cooperation. On the other hand, the most important advantage is the possibility of studying the entire body surface and above all to identify and measure hypersensitivity phenomena, such as thermal allodynia and hyperalgesia.

NEURODIAGNOSTIC SKIN BIOPSY

Neurodiagnostic skin biopsy (NSB) is a relatively new technique for the diagnosis of peripheral neuropathies[16-18]. It is an objective method based on a skin biopsy performed by a circular punch, usually 3 mm diameter, and on immunohistochemical staining techniques that allow identifying the epidermal nerve fibers. To this aim, both bright-field and immunofluorescence (Figure 1) can be used, allowing calculation of the Epidermal Nerve Fiber Density (ENFD)[19]. It is important to underline that epidermal nerve fibers are currently exclusively considered the free nerve endings of small diameter (A-delta and C) afferent fibers[20], a part of the spinothalamic tract physiologically conveying thermal and painful sensations from the periphery to the brain. Interestingly, among all the nerve fibers present in a peripheral nerve, the great majority are just small diameter fibers[21].

NSB FOR THE DIAGNOSIS OF PERIPHERAL NEUROPATHIES IN BODY PARTS IMPOSSIBLE TO INVESTIGATE BY CLINICAL NEUROPHYSIOLOGICAL TESTS

Due to the continuous advances in knowledge that have occurred in the last ten years, NSB is currently considered an important diagnostic tool for neurologists[22,23].

NSB has the important property of being used to in-

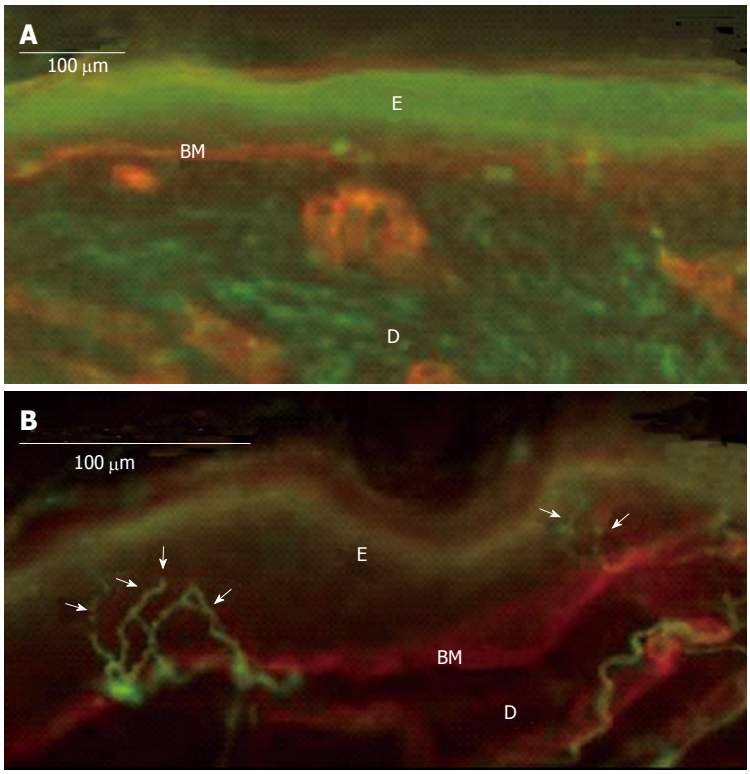

Figure 2 Complete denervation of epidermis (and dermis) in an 82-year-old patient with a severe post-herpetic neuralgia (A), normal, contralateral, mirror skin innervation (13 fibers/mm) (B). Immunofluorescence method: In green, PGP 9.5 staining of nerve fibers; in red, type Ⅳ collagen staining of basement membrane and blood vessels; Arrows: Epidermal nerve fibers; E: Epidermis; D: Dermis; BM: Basement Membrane.

vestigate the skin, allowing obtaining a diagnosis of small fiber axonal neuropathy of peripheral nerves innervating every body part covered by skin[24,25].

This feature appears to be very important because it allows going beyond the possibilities of neurophysiological tests which are available only for a limited number of peripheral nerves. It follows on that NSB allows reaching a diagnosis of neuropathy for "difficult" nerves, such as those of the trunk or occipital nerves frequently (and irregularly) involved in post-herpetic neuralgia[26]. An example of NSB clinical use is given in Figure 2 which shows a severe, unilateral decrease of ENFD in the neck skin of a patient with post-herpetic neuralgia.

Another important property of NSB is the ability to identify lesions involving small branches of peripheral nerves which cannot be investigated by neurophysiological tests. This feature of NSB appears to be particularly important in post-traumatic peripheral nerve lesions where one lesion is different from another.

In this context, it is important to highlight a recent paper where NSB showed a significant asymmetry in a spinal cord injury patient complaining of a bilateral burning and pricking pain at the level of injury[27]. Interestingly, NSB not only allowed demonstration of the presence of two different mechanisms leading to identical symptoms, but also to justify a different efficacy of the same treatment in the two sides. Continuing to talk of possible pain mechanisms, in a very recent paper, NSB findings suggested skin hyperinnervation as a possible cause for the development of dynamic mechanical allodynia following finger amputation[28].

Another recent study confirmed that NSB can allow getting information from the skin of several parts of the body. In that study, the epidermal innervation was studied in burn patients with unilateral injuries, allowing to suggest a possible correlation between the residual cutaneous innervation and the development of chronic pain[29].

NSB can also be useful in other clinical contexts. For example, it can also be used in differentiating neuropathic from referred pain, as demonstrated in a very recent paper in patients with endometriosis and unilateral thigh pain[30]. Moreover, it has been used for assessing the involvement of the peripheral nervous system in a dermatological manifestation of neurological disease, such as a dyshidrotic eczema in a patient with ulnar neuropathy or a unilateral pruritus on the paretic side of a stroke patient[31]. Finally, NSB can also be used to exclude a neuropathic pathophysiology of a clinical pain, as demonstrated in Parry-Romberg syndrome, a rare painful condition characterized by progressive hemifacial atrophy and unilateral facial pain[32].

Considering the current evidence on NSB and the well-known specific diagnostic properties of neurophysiological tests, it is possible to suggest a diagnostic sequence that can be useful to confirm the diagnosis of unilateral peripheral neuropathic pain (Figure 3).

EPIDERMAL INNERVATION SYMMETRY RATIO

One of the main disadvantages of NSB is that it is very difficult to obtain robust normative data for any part of the body because of their different epidermal innervation patterns. This problem can be elegantly solved in cases of unilateral peripheral nerve lesions by comparing the neuropathic skin ENFD with the contralateral, normal side ENFD. To this aim, a bilateral biopsy is necessary

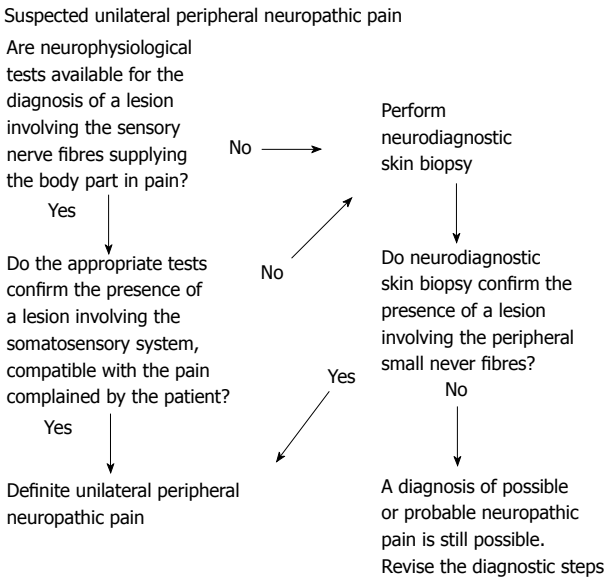

Figure 3 Suggested diagnostic sequences for the confirmation of a peripheral nerve lesion sustaining a definite, peripheral, unilateral neuropathic pain.

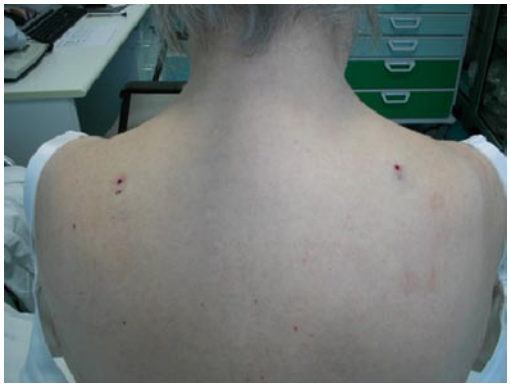

Figure 4 Figure exemplifies the bilateral biopsy needed for comparing the epidermal nerve fiber density of two symmetrical, mirror skin parts.

(Figure 4). It is well known that the two sides of the body of a normal subject are only theoretically symmetrical and a significant asymmetry can be frequently found in several types of biological measures. NSB is not an exception. For this reason, a ratio (the Epidermal Innervation Symmetry Ratio) was developed to compare the epidermal innervation of two symmetrical, mirror parts of the body in normal subjects. Preliminary data were obtained from 133 normal subjects[33]. In particular, when comparing the ENFD of the right with the left side, the ratio showed a normal distribution (mean 1.02; median 1.01; standard deviation 0.21; asymmetry 1.86, kurtosis -0.97). Moreover, when confronting the lower with the higher (contralateral) ENFD, the ratio was quite constant and surprisingly reproducible, also considering different parts of the body (Figure 5).

LIMITATIONS

As with any other diagnostic method, the use of NSB for investigation of the peripheral nerve system has some

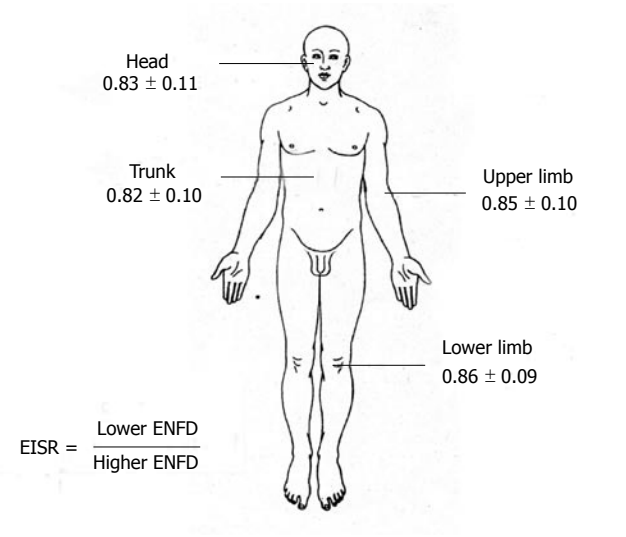

Figure 5 Figure shows the values of epidermal innervation symmetry ratio obtained for different body parts in 133 normal subjects. ENFD: Epidermal Nerve Fiber Density.

limitations. First of all, it is important to mention that NSB is surely not useful for the diagnosis of entrapment neuropathies, particularly in their early phases when only large diameter fibers are involved. Another important limitation is that NSB is a time-consuming method; calculating the time for specimen processing and the manual counting of two blinded investigators and the time for obtaining a reliable medical report, it is usually not less than two weeks. Finally, NSB is currently confined to a small number of specialized diagnostic units.

CONCLUSION

The demonstration of a lesion or a disease involving the somatosensory system is mandatory for the diagnosis of definite neuropathic pain and objective diagnostic tools play an important role to reach the aim. To this end, several methods are currently available but none is suitable for every disease (or lesion). NSB can be an important diagnostic method for the demonstration of peripheral nervous system involvement, with a special reference to small fiber neuropathies and to peripheral nerves not evaluated by other tests. For these characteristics, NSB can be considered a precious instrument for the diagnosis of peripheral unilateral neuropathic pain.

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CASE REPORT

Surgical removal of a large mobile left ventricular thrombus *via* left atriotomy

Daizo Tanaka, Shinya Unai, James T Diehl, Hitoshi Hirose

Daizo Tanaka, Shinya Unai, James T Diehl, Hitoshi Hirose, Division of Cardiothoracic Surgery, Department of Surgery, Thomas Jefferson University, Philadelphia, PA 19107, United States
Author contributions: Tanaka D, Unai S, Diehl JT and Hirose H were all contributed to the patient care, surgery and writing the manuscript.
Correspondence to: Hitoshi Hirose, MD, Division of Cardiothoracic Surgery, Department of Surgery, Thomas Jefferson University, 1025 Walnut Street Room 605, Philadelphia, PA 19107, United States. Hitoshi.Hirose@jefferson.edu
Telephone: +1-215-955-5654 Fax: +1-215-955-6010
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Abstract

Left ventricular (LV) thrombus is a life-threatening complication of severe LV dysfunction. Ventriculotomy has been a commonly performed procedure for LV thrombus; however, it often further decrease LV function after surgery. We present an alternative approach to thrombectomy in order to minimize the postoperative LV dysfunction. A 37-year-old female with a postpartum cardiomyopathy found to have poor LV function and a large left ventricular apical thrombus (3 cm × 3 cm) attached to the apex by a narrow stalk. Given her severe LV dysfunction, the LV thrombus was approached *via* left atriotomy under cardiopulmonary bypass. The LV thrombus was easily extracted with gentle traction *via* the mitral valve. Postoperatively, the patient was discharged home without any embolization event or inotropic support. LV thrombectomy *via* left atriotomy through the mitral valve could be an alternative option for the patients with poor LV function with a mobile LV thrombus.

Key words: Left ventricular thrombus; Atriotomy; Cardiomyopathy; Surgical thrombectomy; Pedunculated thrombus

Core tip: We successfully treated the patient of a large pedunculated left ventricular (LV) thrombus with poor LV function *via* left atriotomy. Compared to conventional ventriculotomy, left atrial approach would be more suitable for emergency LV thrombectomy for highly mobile thrombi because the left atriotomy may not further decrease the LV function and would preserve the LV apex for future ventricular assist device placement.

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INTRODUCTION

Left ventricular (LV) thrombus is a life-threatening complication of severe left ventricular dysfunction. Possible treatment options include anticoagulation, thrombolysis and surgical thrombectomy[1,2]. Small immobile thrombi can be safely managed with anticoagulation; however, treatment for large mobile thrombi is often problematic. LV thrombus is usually associated with poor LV function[3]. Therefore, surgical approaches such as left ventriculotomy, which potentially cause further deterioration of LV function, should be avoided if possible. We present an alternative approach of LV thrombectomy in order to preserve the remaining LV function.

CASE REPORT

A 37-year-old female with a history of postpartum cardiomyopathy and multiple pulmonary embolisms in the

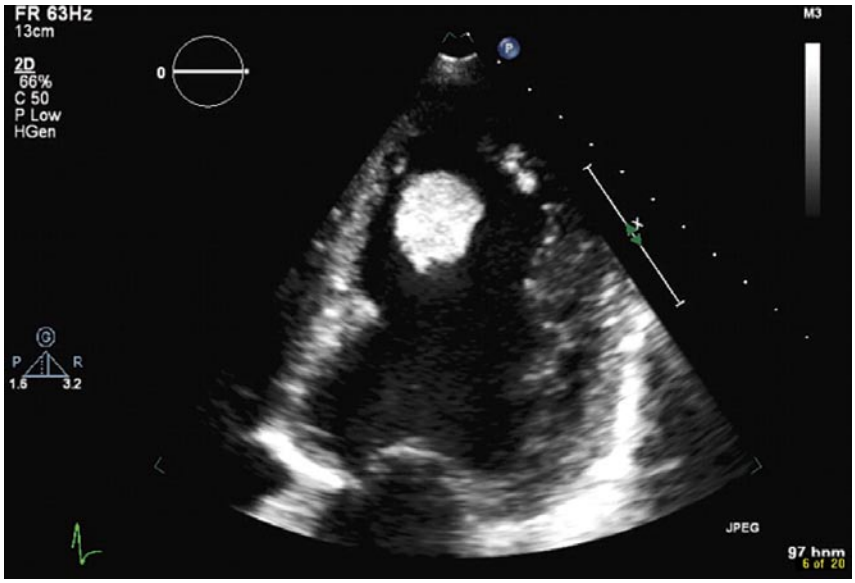

Figure 1 Transthoracic echocardiogram demonstrated a large left ventricular thrombus. It was highly mobile and the risk of embolization was considered to be high.

past presented to an outside hospital with worsening dyspnea on exertion and fatigue 3 mo after her second delivery. She stated that she ran out of her medications for several weeks including rivaroxaban which was prescribed for her possible hypercoagulable state. At the outside hospital she complained of chest pain and underwent right and left heart catheterization, which disclosed a cardiac index of 1.5 L/min per square meter and nonobstructive coronary disease. She was initiated on inotropic support for low output cardiac failure. Her transthoracic echocardiogram followed by transesophageal echocardiogram showed worsening LV function with an ejection fraction of 10%, which was previously 20%, and a large apical pedunculated LV thrombus measuring 3 cm × 3 cm (Figure 1). She was therefore transferred to our hospital for further management.

Considering a narrow stalk and large size of the LV thrombus, the risk of embolization was considered to be high. Emergent surgery was thus undertaken. Under cardioplegic cardiac arrest and cardiopulmonary support, the left atrium was opened at Waterson's groove. A Cosgrove retractor was placed to optimize the exposure of the mitral valve. The LV thrombus was visualized through the mitral valve and was located at the apex connected to the ventricular wall only with a small stalk, which was divided at the base of the papillary muscle. The thrombus was extracted with gentle traction through the mitral valve without difficulty. The LV cavity was extensively irrigated, and then the left atrium was closed. The cross clamp time was 20 min and there was no issue weaning from cardiopulmonary bypass. Postoperatively, the patient was on minimal inotropic support which was successfully weaned off by postoperative day 4. She developed transient atrial fibrillation on postoperative day 3, which was converted to sinus rhythm by medical therapy. The postoperative echocardiogram revealed a small residual mural thrombus measuring 3 mm × 4 mm with left ventricular function of 40% (Figure 2). Hematology was consulted for workup of a possible hypercoagulable state, however all studies were negative. She was placed on coumadin therapy for the residual LV thrombus and was discharged home on postoperative day 10 without an embolic event. Pathologic workup of the mass revealed a large thrombus without any malignant component. Throughout her postoperative course, she has remained symptom free 6 mo after surgery.

DISCUSSION

First line of treatment for a LV thrombus is anticoagulation; however, a large mobile thrombus as is in this case often requires urgent surgical thrombectomy. The concern with surgical removal of a large LV thrombus is ventricular function, since it is often seen in patients with poor LV function. The conventional approach to LV thrombus is left ventriculotomy[4,5]. Ventriculotomy provides direct visualization of the thrombus; thus it has been considered the standard approach for complete removal of the thrombus. This may be best utilized for mural thrombus which is adhered to the ventricular wall. However, LV ventriculotomy often causes further deterioration of the LV function[6], and should be avoided in cases of poor LV function if possible. Furthermore, if once the left ventriculotomy was performed, future placement of the ventricular assist device in case of further deterioration of the LV function would be more complicated. Another possible approach is thrombus extraction *via* aortotomy. This trans-aortic approach has been reported in conjunction with the video-assisted thoracoscopy to facilitate visualization[7]. However, the size of the thrombus is often the limiting factor in this approach and was too large to pass through the aortic valve in this case.

A left atrial approach does not require incision to the LV, thus theoretically preserves the remaining LV function. This approach also provides adequate visualization of the thrombus and trans-mitral valve extraction allows extraction of a larger thrombus than the trans-aortic ap-

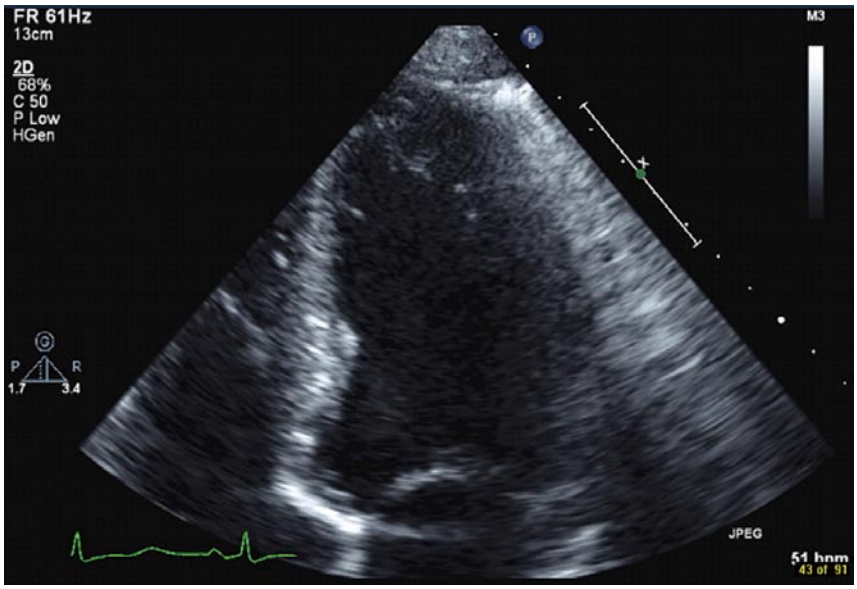

Figure 2 Postoperative transthoracic echocardiogram demonstrated only minimally remaining mural thrombus.

proach[8-10]. The potential disadvantage of the left atrial approach would be limited room for maneuvering of the thrombus and should be reserved only for one that is loosely connected to the ventricular wall with a narrow stalk, which is exactly the case that emergent thrombectomy is usually indicated. When surgical thrombectomy is indicated for mural thrombi, which can usually be managed with anticoagulation, the left atrial approach should not be selected because extensive debridement is expected. These cases should be operated semi-electively with a standby left ventricular assist device since further deterioration of the LV function is expected after ventriculotomy. Therefore, we advocate left atriotomy as an alternative approach for emergent LV thrombectomy.

COMMENTS

Case characteristics

A 37-year-old female with a history of postpartum cardiomyopathy presented with chest pain and dyspnea 3 mo after her second delivery.

Clinical diagnosis

Echocardiogram showed worsening left ventricular (LV) dysfunction (ejection fraction of 10%) with a large left ventricular apical thrombus (3 cm × 3 cm) attached to the apex with a narrow stalk.

Differential diagnosis

Differential diagnosis included intracardiac thrombus, primary or metastatic tumor and cardiac myxoma.

Laboratory diagnosis

The patient's cardiac index was 1.5 L/min per square meter and ejection fraction of 10%.

Imaging diagnosis

Echocardiogram showed a large left ventricular apical thrombus (3 cm × 3 cm) attached to the apex with a narrow stalk.

Pathological diagnosis

The removed mass was found to be a thrombus.

Treatment

The left ventricular thrombus was removed via the right-sided left atrium though the mitral valve.

Related reports

Conventional LV thrombectomy by left ventriculotomy; may this decrease the left ventricular function after surgery.

Experiences and lessons

Compared to conventional ventriculotomy, left atrial approach would be more suitable for emergency LV thrombectomy for highly mobile thrombi because the left atriotomy may not have any effect on the left ventricular function and would preserve the left ventricular apex for future ventricular assist device placement.

Peer review

Left ventricular thrombectomy *via* the left atrium though the mitral valve would be most feasible for the thrombus connected to the left ventricle with a narrow stalk.

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CASE REPORT

Unexpected anomaly of the common bile duct and pancreatic duct

Disaya Chavalitdhamrong, Peter V Draganov

Disaya Chavalitdhamrong, Peter V Draganov, Division of Gastroenterology, Hepatology, and Nutrition, University of Florida, Gainesville, FL 32608, United States

Author contributions: Chavalitdhamrong D had involved in drafting the manuscript; Draganov PV had involved in critical revision of the manuscript.

Correspondence to: Peter V Draganov, MD, Professor of Medicine, Division of Gastroenterology, Hepatology, and Nutrition, University of Florida, 1329 SW 16th Street Suite 5251, Gainesville, FL 32608, United States. dragapv@medicine.ufl.edu
Telephone: +1-352-2739472 Fax: +1-352-6279002
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Abstract

Variations in the bile duct and pancreatic duct opening are related to the process of rotation and recanalization during embryologic development. Complete non-union of distal common bile duct and pancreatic duct gives rise to double papillae of Vater. The separation of the drainage of the main pancreatic duct and bile duct can be appreciated by careful assessment at the time of endoscopic retrograde cholangiopancreatograpy. The cranial orifice is a bile duct opening, whereas the caudal orifice is a pancreatic duct opening. The separate orifice finding can be confirmed by cholangiogram and pancreatogram with no communication between the two orifices. Endoscopists should be aware of this rare variant because late recognition can result in unnecessary manipulation and contrast injections of the main pancreatic duct and biliary cannulation failure.

Key words: Double major papillae; Double orifices; Cannulation; Bile duct; Endoscopic retrograde cholangiopancreatography

Core tip: Drainage of the main pancreatic and bile duct as two separate orifices is a recognized, but very rare anatomical variant. It is also referred to as double major papillae.

Chavalitdhamrong D, Draganov PV. Unexpected anomaly of the common bile duct and pancreatic duct. *World J Clin Cases* 2014; 2(2): 36-38 Available from: URL: http://www.wjgnet.com/2307-8960/full/v2/i2/36.htm DOI: http://dx.doi.org/10.12998/wjcc.v2.i2.36

INTRODUCTION

The common bile duct and the pancreatic duct coalesce into one duct at the level of the ampulla, before they open into the duodenum *via* a single orifice. A variation in the bile duct and pancreatic duct opening causing two separate orifices is a rare anatomical variant as they fail to coalesce (also known as double papillae). This variant does not predispose to any pancreatobiliary disease, but recognition at the time of endoscopic retrograde cholangiopancreatography (ERCP) is crucial to ensure the procedures technical success. We present a case of a patient with separate drainage orifices of the bile and pancreatic duct which initially was not appreciated. This resulted in obtaining unnecessary pancreatograms, a prolonged procedure and increased risk for post-ERCP pancreatitis.

CASE REPORT

A 27-year-old presented 3 wk post-partum with acute right upper quadrant abdominal pain associated with elevated liver function tests (aspartate aminotransferase of 396 U/L, alanine aminotransferase of 364 U/L, total bilirubin of 1.5 mg/dL, and alkaline phosphatase of 510 U/L). Abdominal ultrasonography revealed a dilated common bile duct of 12 mm and mild intrahepatic ductal

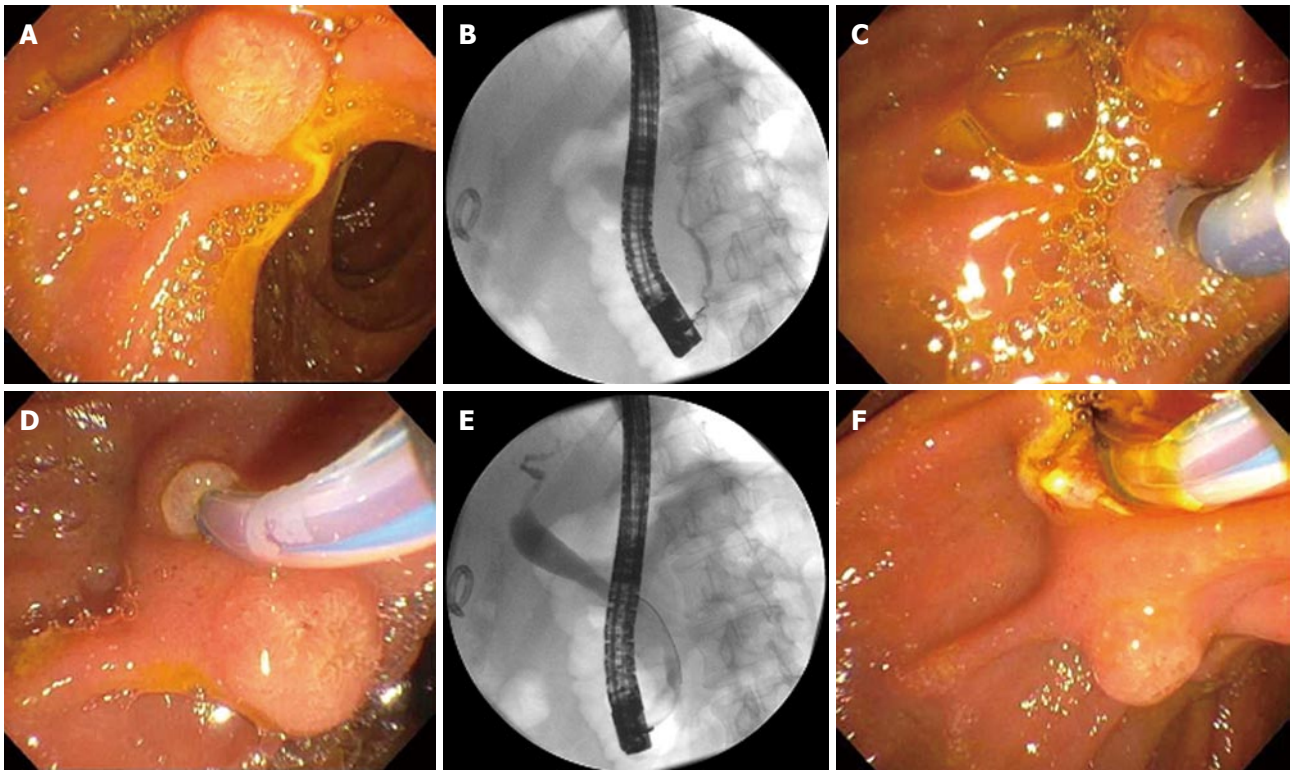

Figure 1 The patient underwent an endoscopic retrograde cholangiopancreatography for stone removal. A: The major papilla appeared normal; B: Normal pancreatogram; C: The major papilla was re-examined; D: Cannulation of the bile duct through the second orifice; E: Biliary tract with biliary stone within the distal common bile duct; F: Biliary sphincterotomy.

dilatation. Magnetic resonance cholangiopancreatography showed a four millimeter stone in the distal common bile duct.

The patient underwent an ERCP for stone removal. The major papilla appeared normal (Figure 1A). Multiple cannulation attempts resulted in repeat pancreatograms (Figure 1B). The major papilla was re-examined, and what originally was thought to be the minor papilla was found to be located at the roof of the major papilla (Figure 1C). This appearance raised the possibility of two separated orifices of the bile duct and the main pancreatic duct, which independently drain with a separation of 10 mm. Indeed, that was confirmed after cannulation of the bile duct through the second orifice (Figures 1D and E). Biliary sphincterotomy was preformed (Figure 1F) and the biliary stone was easily extracted. Rectal indomethacin was given as a prophylactic measure for prevention of post-ERCP pancreatitis[1]. The patient later underwent a cholecystectomy, and her hospital course was uneventful.

DISCUSSION

Drainage of the main pancreatic and bile duct as two separate orifices is a recognized, but very rare anatomical variant. It is also referred to as double major papillae. The two separate openings are usually not apparent without close inspection[2]. The cranial orifice communicates with the common bile duct and the caudal orifice communicates with the duct of Wirsung[3]. Double papilla of Vater cannulation of the common bile duct and pancreatic duct could be accomplished through either orifice independently[4,5]. Endoscopists should be aware of this rare variant because late recognition can result in unnecessary manipulation and contrast injections of the main pancreatic duct. Fortunately, our patient did not develop post-ERCP pancreatitis. Furthermore, inability to recognize this anatomic variant can lead to biliary cannulation failure.

COMMENTS

Case characteristics

This case demonstrates a rare endoscopic finding of papilla during endoscopic retrograde cholangiopancreatography.

Clinical diagnosis

A non-union of the bile duct and pancreatic duct opening causes two separate orifices.

Differential diagnosis

The confirmation of two separate ampullary structures can differentiate double major papillae of Vater from other diagnoses.

Laboratory diagnosis

Cannulation of both orifices can prove that they are the openings of the common bile duct and the pancreatic duct.

Imaging diagnosis

Cannulation of the cranial orifice shows cholangiogram, whereas cannulation of the caudal orifice shows pancreatogram.

Pathological diagnosis

Cannulation of each orifice can evaluate the biliary or pancreatic abnormality.

Treatment

Therapeutic interventions by endoscopic retrograde cholangiopancreatography (ERCP) can be performed after proper cannulation.

Related reports

A literature search revealed only a few documented cases of double papillae of Vater.

Term explanation

Double major papillae of Vater are separate drainages of the common bile duct and the pancreatic duct. The cannulation of the common bile duct and pancreatic duct can be achieved through either orifice independently.

Experiences and lessons

The unnecessary pancreatograms are associated with increased risk for post-ERCP pancreatitis. Fortunately, the patient did not develop post-ERCP pancreatitis.

Peer review

Careful inspection of the ampulla finding the two openings can lead to appropriate cannulation of the common bile duct and pancreatic duct through either orifice independently.

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CASE REPORT

Severe isolated sciatic neuropathy due to a modified lotus position

Jacob Wycher Bosma, Juerd Wijntjes, Ton Antonius Hilgevoord, Jan Veenstra

Jacob Wycher Bosma, Jan Veenstra, Department of Internal Medicine, Sint Lucas Andreas Hospital, 1061AE Amsterdam, The Netherlands
Juerd Wijntjes, Ton Antonius Hilgevoord, Department of Neurology, Sint Lucas Andreas Hospital, 1061 Amsterdam, The Netherlands
Author contributions: Bosma JW contributed to conception and design case history, drafting case history, final approval of the version to be published; Wijntjes J contributed to conception and design case history, performing and interpretation of electromyography, drafting case history, final approval of the version to be published; Hilgevoord TA contributed to performing and interpretation of electromyography, revising article for intellectual content, final approval of the version to be published; Veenstra J contributed to design case history, revising article for intellectual content, final approval of the version to be published.
Correspondence to: Jacob Wycher Bosma, MD, Department of Internal Medicine, Sint Lucas Andreas Hospital, Jan Tooropstraat 164, 1061AE Amsterdam,
The Netherlands. jacob.bosma@slaz.nl
Telephone: +31-20-5108770 Fax: +31-20-5108955
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Key words: Sciatic neuropathy; Lotus neuropathy; Sciatic nerve

Core tip: In this case history we report on a patient with a severe isolated sciatic neuropathy with a foot drop, a complication of prolonged sitting in a modified lotus position. Although rare, similar reports of sciatic nerve injury due to external compression as a result of prolonged or repeated sitting in the same position have been reported. A so-called "lotus neuropathy" should be included in the differential diagnosis in patients presenting with a isolated sciatic neuropathy.

Bosma JW, Wijntjes J, Hilgevoord TA, Veenstra J. Severe isolated sciatic neuropathy due to a modified lotus position. *World J Clin Cases* 2014; 2(2): 39-41 Available from: URL: http://www.wjgnet.com/2307-8960/full/v2/i2/39.htm DOI: http://dx.doi.org/10.12998/wjcc.v2.i2.39

Abstract

A 51-year-old man presented to our hospital with progressive pain and weakness in his right leg. Neurological examination revealed atrophy of all muscles of the right leg, unilateral foot drop and paralysis of the anterior tibial and gastrocnemicus muscles. Electromyography confirmed a severe isolated sciatic neuropathy in the thigh. For unclear reasons, our patient habitually used to sit in a modified lotus position. We concluded that this position, in literature known as "lotus neuropathy" had resulted in the sciatic neuropathy. After more than a year our patient was referred again to our outpatient clinic. At that time there was only minimal improvement, now with an achilles tendon contracture and pes equinus due to immobility.

INTRODUCTION

Isolated sciatic nerve injury is a common clinical situation. Several mechanisms are responsible for sciatic neuropathies. In this case report we describe a patient with complete paralysis of the right leg due to prolonged sitting in a modified lotus position.

CASE REPORT

A 51-year-old male fugitive from Iran with post-traumatic stress disorder and schizophrenia presented to our hospital with progressive pain and weakness in the right lower extremity and with difficulty in walking. The symptoms had been present for 6 mo and there was no history of a trauma. The patient denied back pain, bowel or bladder

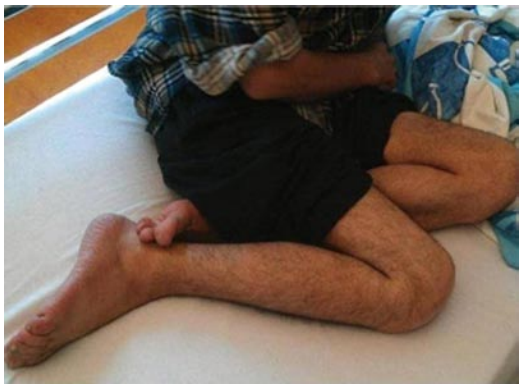

Figure 1 Photograph of our patient sitting in a modified lotus position. We hypothesized that repeated sitting in this position, with the right thigh on the heel of the left foot, had lead to compression and subsequent injury of the right sciatic nerve.

incontinence or sexual dysfunction. He drank alcohol occasionally.

General physical examination was unremarkable. Neurological examination demonstrated atrophy of all muscles of the right lower extremity. He ambulated with a steppage gait associated with an unilateral foot drop and ankle instability. Patient complained of dysesthetic pain, described as a constant burning sensation in the distal sciatic nerve distribution. Pinprick sensation was diminished in the distribution of the right peroneal nerve. The anterior tibial and gastrocnemicus muscles were paralysed (grade 0 MRC scale). Strength was normal in the more proximal sciatic innervated muscles. The right ankle reflex was absent.

His general practitioner mentioned that, for unclear reasons, our patient habitually used to sit in a modified lotus position (Figure 1). We hypothesized that repeated sitting in this position, with the right thigh on the heel of the left foot, had lead to compression and subsequent injury of the right sciatic nerve. Magnetic resonance imaging of the spine was normal. Electromyography and nerve conduction studies confirmed a severe isolated sciatic neuropathy in the thigh of the right lower extremity (Figure 2).

DISCUSSION

The causes of sciatic mononeuropathy can be divided into those occurring in the hip and the thigh region. Only the minority of sciatic neuropathies are localised in the thigh and several mechanisms can lead to sciatic nerve damage in this region[1]. Most frequently the nerve injury is the result of a femur fracture, posterior thigh compartment syndrome, laceration, nerve infarction, mass lesions or acute external compression. Prolonged external compression of the sciatic nerve results in nerve damage from ischemia or from direct mechanical laceration of the nerve.

In literature similar cases with development of sciatic nerve injury due to external compression as a result of prolonged or repeated sitting in the same position have been reported. Sciatic neuropathy occurring as an intraoperative pressure palsy is a well-known complication of

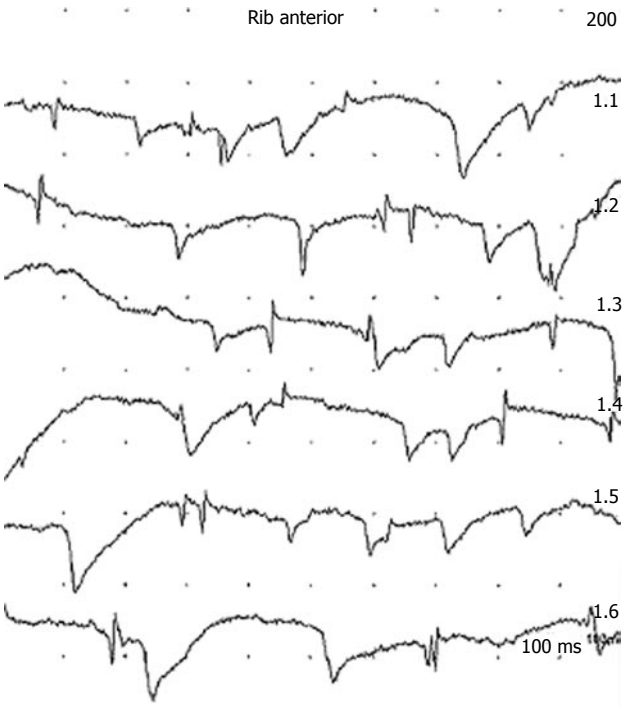

Figure 2 Needle electromyography revealed spontaneous muscle fibre activity due to denervation in the paralysed right tibial anterior muscle.

surgery[2]. "Toilet seat" sciatic neuropathy as a complication of gluteal compartment syndrome has been reported in alcoholic intoxicated people falling asleep on a toilet[3]. Furthermore, injury of the sciatic nerve after yoga meditation is a known entity, called "lotus neuropathy"[4,5].

Our patient was managed conservatively and subsequently failed to follow up after discharge, but was finally referred again to our outpatient department after more than a year. At that moment there was a minimal improvement of neurologic function of the leg. Additionally, an achilles tendon contracture and pes equinus had developed due to immobility.

In conclusion, in this paper we report a patient with an isolated sciatic neuropathy due to compression of the thigh as a result of sitting in a modified lotus position.

COMMENTS

Case characteristics

This patient complained of progressive pain and a 6-mo history of weakness in the right lower extremity and with difficulty in walking.

Clinical diagnosis

Further examination revealed a complete and isolated sciatic neuropathy due to compression of the thigh as a result of sitting in a modified lotus position.

Differential diagnosis

The differential diagnostic considerations were nerve injury as a result of a femur fracture, posterior thigh compartment syndrome, laceration, nerve infarction, mass lesions or acute external compression.

Imaging diagnosis

Magnetic resonance imaging of the spine was normal. Electromyography and nerve conduction studies confirmed a severe isolated sciatic neuropathy in the thigh of the right lower extremity.

Treatment

The patient was managed conservatively and referred to a physiotherapist, but

subsequently failed to follow up.

Term explanation

"Lotus neuropathy" is an entity due to injury of the sciatic nerve after yoga meditation.

Experiences and lessons

Although rare, a so-called "lotus neuropathy" should be included in the differential diagnosis in patients presenting with a isolated sciatic neuropathy.

Peer review

The authors report an interesting clinical case with a novel clinical entity. Presentation is extremely clear.

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CASE REPORT

Utility of diffusion-weighted imaging in the diagnosis of inguinal lymph node metastasis with malignant melanoma

Ummugulsum Bayraktutan, Mecit Kantarci, Berhan Pirimoglu, Hayri Ogul, Aylin Okur, Nesrin Gursan

Ummugulsum Bayraktutan, Mecit Kantarci, Berhan Pirimoglu, Hayri Ogul, Aylin Okur, Department of Radiology, School of Medicine, Atatürk University, 25240 Erzurum, Turkey
Nesrin Gursan, Department of Pathology, School of Medicine, Atatürk University, 25240 Erzurum, Turkey
Author contributions: Bayraktutan U, Kantarci M and Pirimoglu B designed the research and wrote the paper; Kantarci M, Pirimoglu B and Ogul H performed the research; Kantarci M, Okur A and Gursan N analyzed the data.
Correspondence to: Mecit Kantarci, MD, PhD, Department of Radiology, School of Medicine, Atatürk University, 200 Evler Mah, 14, Sok No 5 Dadaskent, 25240 Erzurum, Turkey. akkanrad@hotmail.com
Telephone: +90-442-2361212 Fax: +90-442-2361301
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Abstract

Malignant melanoma is a malignancy of pigment-producing cells (melanocytes) located predominantly in the skin. Nodal metastases are an adverse prognostic factor compromising long term patient survival. Therefore, accurate detection of regional nodal metastases is required for optimization of treatment. Computed tomography (CT) and magnetic resonance imaging (MRI) remain the primary imaging modalities for regional staging of malignant melanoma. However, both modalities rely on size-related and morphological criteria to differentiate between benign and malignant lymph nodes, decreasing the sensitivity for detection of small metastases. Surgery is the primary mode of therapy for localized cutaneous melanoma. Patients should be followed up for metastases after surgical removal. We report here a case of inguinal lymph node enlargement with a genital vesicular lesion with a history of surgery for malignant melanoma on her thigh two years ago. CT and diffusion weighted-MRI (DW-MRI) were applied for the lymph node identification. DW-MRI revealed malignant lymph nodes due to malignant melanoma metastases correlation with pathological findings.

Key words: Diffusion-weighted imaging; Magnetic resonance imaging; Inguinal lymph node; Malignant melanoma; Metastasis; Apparent diffusion coefficient

Core tip: Diffusion-weighted magnetic resonance imaging (DW-MRI) measures differences in tissue microstructure based on the random displacement of water molecules. The differences in water mobility are quantified using the apparent diffusion coefficient which has an inverse relationship with tissue cellularity. As such, the technique is able to differentiate between tumoral tissue and normal or necrotic tissue. In this paper, we present an inguinal lymph node metastasis of malignant melanoma after surgery, with DW-MRI findings.

Bayraktutan U, Kantarci M, Pirimoglu B, Ogul H, Okur A, Gursan N. Utility of diffusion-weighted imaging in the diagnosis of inguinal lymph node metastasis with malignant melanoma. *World J Clin Cases* 2014; 2(2): 42-44 Available from: URL: http://www.wjgnet.com/2307-8960/full/v2/i2/42.htm DOI: http://dx.doi.org/10.12998/wjcc.v2.i2.42

INTRODUCTION

Malignant melanoma is located predominantly in the skin but also found in the eyes, ears, gastrointestinal tract, leptomeninges and oral and genital mucous membranes. Melanoma accounts for only 4% of all skin cancers; however, it causes the greatest number of skin cancer-related deaths worldwide. Early detection of thin cutaneous melanoma is the best means of reducing mortality[1]. We present a case with inguinal lymph node enlargement with a genital vesicular lesion with a history of surgery

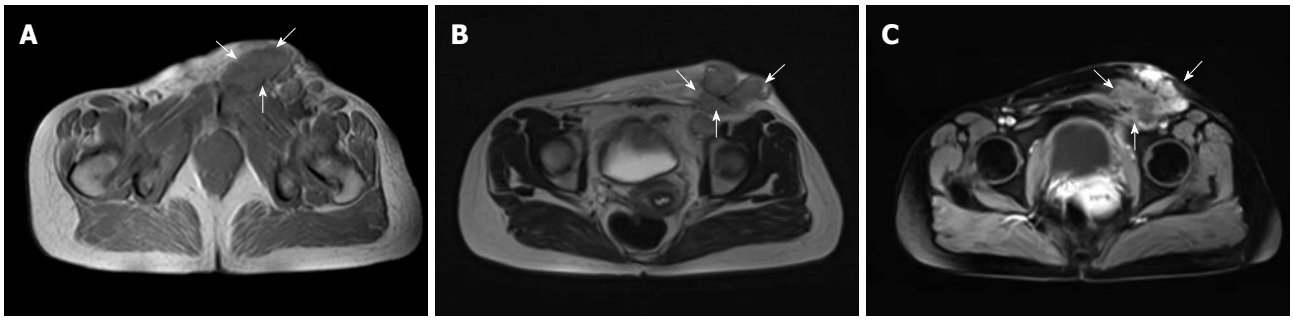

Figure 1 Axial T1 weighted image (A), T2 weighted image (B) and contrast enhanced fat saturated T1 image (C) showing contrast enhancing inguinal conglomerated lymph node enlargement (arrows).

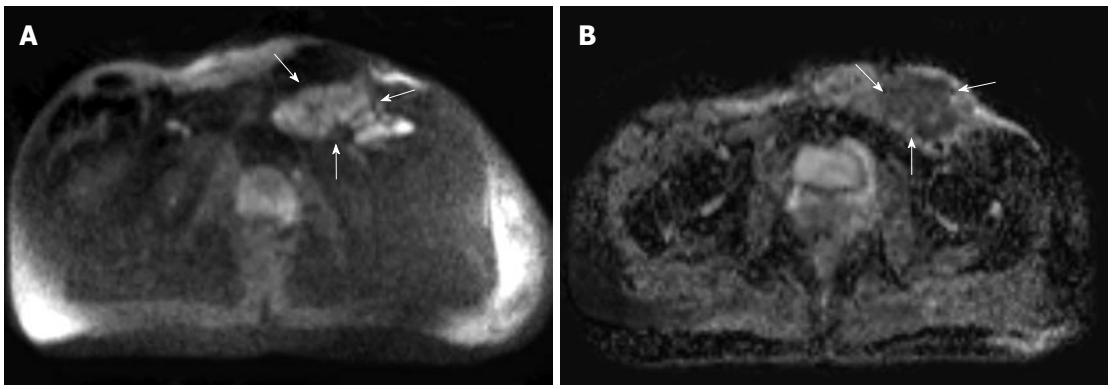

Figure 2 Diffusion weighted images b800 (A) and apparent diffusion coefficient map (B) showing diffusion restriction in inguinal conglomerated lymph nodes (arrows).

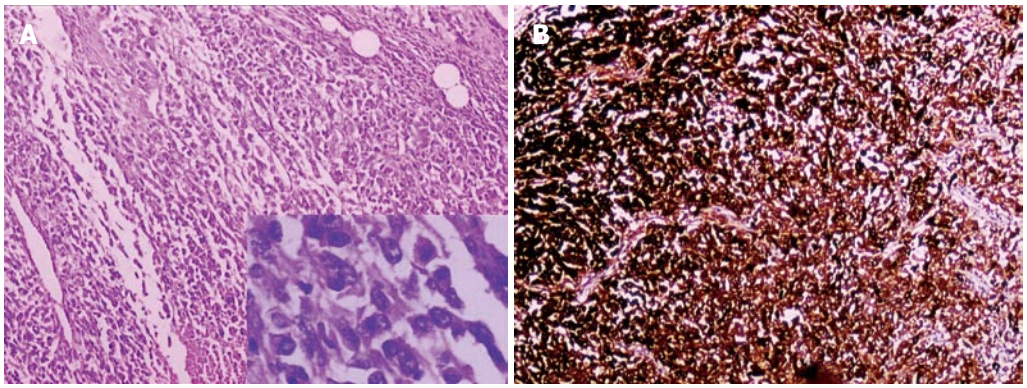

Figure 3 Pathological examination. A: Photomicrograph of metastatic malignant melanoma in the inguinal lymph node (HE, × 50). The bottom right corner HE, × 100; B: Immunohistochemical study shows that the spindle cells are positive for HMB-45.

for malignant melanoma two years ago.

CASE REPORT

A 38-year-old woman was admitted to our hospital complaining of a mass on her left inguinal region for about 1 mo. On physical examination there was left inguinal lymph node swelling and a genital vesicular lesion. The patient had a history of malignant melanoma on her thigh 2 years ago. Computed tomography (CT) scans showed inguinal conglomerated lymph node enlargement that may be inflammatory due to a genital lesion or malignant melanoma metastases. Magnetic resonance imaging (MRI) also showed inguinal conglomerated lymph node enlargement (Figure 1). Diffusion-weighted MRI revealed reduced apparent diffusion coefficient (ADC) values in these lymph nodes consistent with malignancy (Figure 2). After removal of the mass by surgery, histopathological examination showed evidence of malignant melanoma metastases (Figure 3).

DISCUSSION

Malignant melanoma arises from melanocytes, the cells

that give skin its color, and can spread to nearby lymph nodes and, eventually, distant sites in the body. Approximately 50000 new cases of malignant melanoma occur in the United States every year and about 8000 people die from this most lethal form of skin cancer. If untreated, malignant melanomas can spread rapidly, sometimes causing death within months of diagnosis. However, the five year cure rate of early, superficial lesions is nearly 100%[1,2].

Melanomas can occur on mucous membranes of the mouth, genital regions and anus. Sun-exposed areas are at higher risk than shielded areas. Although melanomas can occur anywhere on the body, and some types are more likely to be found in some areas than others, women tend to develop more melanomas on their legs, while men's arise more frequently on the torso[2].

Risk factors for malignant melanoma are sun exposure, white race, first degree relatives with a history of melanoma (may increase one's risk by up to eight times), personal history of previous melanoma, dysplastic nevus syndrome, large congenital melanocytic nevi, lentigo maligna ("Hutchinson's freckle"), history of other non-melanoma skin cancers, immunosuppression and higher numbers of melanocytic nevi (moles)[3].

Surgical removal of melanomas that have not metastasized or penetrated to deeper layers of skin is often curative. Metastatic disease is generally inoperable. Lymph node dissection, immunotherapy, vaccine therapy, chemotherapy and hyperthermia are among the modalities used to treat metastases[4]. Current the National Comprehensive Cancer Network guidelines do not recommend surveillance laboratory or imaging studies for asymptomatic patients with stage ⅠA, ⅠB and ⅡA melanoma (*i.e.*, tumors ≤ 4 mm depth). Imaging studies (chest radiograph, CT and/or positron emission tomography-CT) should be obtained as clinically indicated for confirmation of suspected metastasis or to delineate the extent of disease and may be considered to screen for recurrent/metastatic disease in patients with stage ⅡB-Ⅳ disease, although this latter recommendation remains controversial. Routine laboratory or radiological imaging in asymptomatic melanoma patients of any stage is not recommended after 5 years of follow-up[5].

CT and MRI facilitate detection of lymph nodes; however, both modalities rely on size-related and morphological criteria to differentiate between benign and malignant lymph nodes. Diffusion-weighted imaging measures differences in tissue microstructure based on the random displacement of water molecules. The magnitude of water molecule movement is expressed as an ADC value. Its usefulness in the diagnosis of malignant tumors has gained interest. The technique is able to differentiate between tumoral tissue and normal or necrotic tissue[5,6]. The improved nodal identification may aid treatment planning and further nodal characterization[7]. In conclusion, DWI is recommended for evaluation of lymph node metastasis in patients with malignant melanoma.

COMMENTS

Case characteristics

A 38-year-old woman was admitted to the hospital with complaint of a mass on her left inguinal region for about 1 mo ago.

Clinical diagnosis

On physical examination there were left inguinal lymph node swelling and a genital vesicular lesion.

Imaging diagnosis

Computed tomography (CT) scans showed inguinal conglomerated lymph node enlargement, may be inflammatory due to genital lesion or malignant melanoma metastases.

Treatment

CT and diffusion weighted-magnetic resonance imaging (DW-MRI) were applied for the lymph node identification, DW-MRI revealed malignant lymph nodes due to malignant melanoma metastases correlation with pathological findings.

Experiences and lessons

DWI is recommended for evaluation of lymph node metastasis in patients with malignant melanoma.

Peer review

Presentation and readability of the manuscript is good, the paper is brief, concise, the text is clear and easily comprehensible, adequately describes the course of the disease, its diagnostics and treatment of the patient.

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CASE REPORT

Baastrup's disease: The kissing spine

Amit Singla, Vivek Shankar, Samarth Mittal, Abhinav Agarwal, Bhavuk Garg

Amit Singla, Vivek Shankar, Samarth Mittal, Abhinav Agarwal, Bhavuk Garg, Department of Orthopaedics, All India Institute of Medical Sciences, New Delhi 110039, India
Author contributions: Singla A wrote and finalized the manuscript and reviewed the literature; Shankar V, Agarwal A contributed to the manuscript and finalized it; Garg B provided the case and finalized the manuscript; Mittal S did the literature search, contributed to the manuscript and finalized it.
Correspondence to: Dr. Samarth Mittal, MS, Senior Resident, Department of Orthopedics, All India Institute of Medical Sciences, Teaching Block, 5th floor AIIMS, New Delhi 110039, India. samarthmittal@gmail.com
Telephone: +91-901-3562489 Fax: +11-26-583441
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Abstract

A 67-year-old male presented with a gradually progressive low back pain of 2 years duration. The patient was leading a retired life and there was no history of chronic fever or significant trauma. There was no radiation of pain or any features suggestive of claudication. There was no history of any comorbidity. The pain was aggravated with extension of the spine and relieved with flexion. There was no swelling or neurological deficit, but muscle spasm was present. Radiographs of the spine revealed degenerative changes in the lumbosacral spine, along with articulation of spinous processes at in lumbar spine at all levels level suggestive of Baastrup's disease, commonly known as "kissing spine". Routine blood investigations were within normal limits. The patient was managed conservatively. He was given a week's course of analgesics and muscle relaxants and then started on spinal flexion exercises, with significant improvement being noted at 6 months follow up.

Key words: Baastrup's disease; Neoarthrosis; Spinous process; Kissing spine; Osteophytes; Low back ache; Back pain

Core tip: Baastrup's disease, although not a rare entity, is often misdiagnosed and wrongly treated due to poor knowledge. Complete evaluation and a detailed examination of radiographic images are crucial for a proper diagnosis and to avoid mismanagement of the condition, including a hasty surgical intervention.

Singla A, Shankar V, Mittal S, Agarwal A, Garg B. Baastrup's disease: The kissing spine. *World J Clin Cases* 2014; 2(2): 45-47 Available from: URL: http://www.wjgnet.com/2307-8960/full/v2/i2/45.htm DOI: http://dx.doi.org/10.12998/wjcc.v2.i2.45

INTRODUCTION

Baastrup's disease (kissing spine) is a relatively common entity characterized by degenerative changes of spinous processes and inter-spinous soft tissues. It involves the formation of hypertrophic spinous processes, an important cause of mechanical back pain, and accompanying degenerative disc disease. Most of the cases previously described in the literature were managed either surgically or with fluoroscopy image guided steroid injections. To the best of our knowledge, this is the first case showing significant improvement with only conservative management.

CASE REPORT

A 67-year-old male presented with gradually progressing low back pain of 2 years duration. The pain was aggravated with extension of the spine and relieved with flexion. There was no evidence suggestive of radiation of pain or any clinical features suggestive of claudication. The patient had no additional comorbidity. There was no history of chronic fever or significant trauma. Radiographs of the spine revealed degenerative changes involving the lumbosacral spine, along with articulation of spinous processes at at multiple levels level (Figure 1),

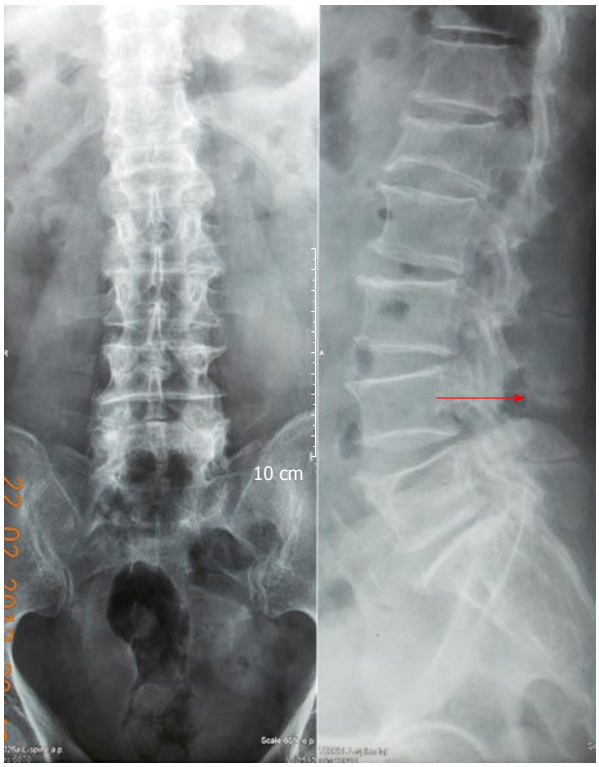

Figure 1 Radiographs of lumbar spine in anterior-posterior and lateral views showing Baastrup's disease at at multiple lumbar level.

commonly known as "kissing spine" and strongly suggestive of Baastrup's disease in the absence of any other features. The patient was managed conservatively with muscle relaxants and analgesics for one week and, once the pain subsided, was started on physiotherapy with spinal flexion exercises. The treatment plan involved conservative management with a close follow up. The option of intralesional steroid injections and bursal excision was to be considered if conservative treatment failed. The patient was monitored at the outpatient department at regular intervals and at 6 mo follow up was found to have significant improvement with physiotherapy alone and hence was asked to continue the exercises.

DISCUSSION

This condition was first described as a neoarthrosis between adjacent spinous processes by Mayer[1]. Brailsford[2] demonstrated the same entity and labeled it "kissing spines". Baastrup[3] described this condition again in detail and subsequently this condition came to be known as Baastrup's disease. It was noted clinically in 6.3% of college athletes[4], most commonly gymnasts, and was thought to be related to the repetitive flexion and extension attributed to the sport. In a recent study by Kwong *et al*[5], Baastrup's disease was found in 413 (41.0%) patients (diagnostic criteria being close approximation and contact between apposing spinous processes and sclerosis of the superior and inferior portions of adjacent processes on computed tomography) with an incidence of 81.3% among patients older than 80 years, whereas Maes *et al*[6] reported an overall incidence of 8.2% with the presence of a bursa between spinous process as a diagnostic criteria based on magnetic resonance imaging.

Two cohort studies have demonstrated conflicting reports of clinical improvement following surgical intervention. This included one early study of 10 patients by Franck[7] in 1944 in which the patients undergoing surgical excision of the spinous process for Baastrup's disease demonstrated improvement. A later study by Beks *et al*[8] in 1989 in which 64 patients who underwent either partial or total surgical excision of the lumbar spinous processes demonstrated that surgery does not always alleviate the patient's pain. Their research suggested that "kissing spine" might not be a disease entity itself but an additional pathology, specifically spondylosis with osteophyte formation. A case has been reported of atrophy and fatty replacement of the paraspinal musculature in a patient with Baastrup's disease on X-ray[8]. Pain can be attributed to multiple factors in Baastrup's disease, including mechanical pain secondary to the hypertrophic spinous processes coming into contact with each other, secondary to degenerative disc disease, and interspinous bursal fluid collections extending through the ligamentum flavum, leading to central canal stenosis[9]. In 2004, Pinto *et al*[10] reported 2 cases of spinous process fractures in patients with Baastrup's disease and proposed that close proximity of the spinous processes resulted in its fracture and hence pain. Management includes decompression and posterior spinal instrumentation surgery or fluoroscopically guided interspinous steroid injections[11].

In conclusion, Baastrup's disease is not a rare cause of back pain in the elderly but it is frequently missed on radiographs due to lack of knowledge about the disease on the part of physician and overexposure of spinous processes in most X rays. Most of the management suggested in the literature is invasive, *i.e.,* surgery or intralesional injections. However, conservative management can also produce good results. Hence, it is imperative that the treating physician must attempt a conservative line of management before moving onto invasive modalities. Since this condition is one of the few treatable causes of back pain in the vast spectrum of spinal conditions, one must be aware of the condition to correctly diagnose and institute a line of treatment most beneficial to the patient.

COMMENTS

Case characteristics

A 67-year-old male presented with a gradually progressive low back pain of 2 years duration.

Clinical diagnosis

Baastrup's disease is not a rare cause of back pain in elderly, with pain aggravated on extension and relieved on bending forward.

Differential diagnosis

Common differential diagnoses include lumbar spondylosis, muscle strain, spondylolisthesis, fracture of the spinous process, vertebral compression fractures and infectious etiologies of the spine.

Imaging diagnosis

Radiographs showing articulation of spinous processes, *i.e.*, the kissing spine.

Peer review

The authors present a nice case report.

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CASE REPORT

Ameloblastic carcinoma: Report of a rare case

Mandadi Dakshinamurthy Srikanth, Besta Radhika, Kiran Metta, Nukala Valli Renuka

Mandadi Dakshinamurthy Srikanth, Besta Radhika, Department of Oral Medicine and Radiology, MNR Dental College and Hospital, Sangareddy 502001, India
Kiran Metta, Department of Conservative Dentistry and Endodontics, Midsr Dental College and Hospital, Latur, Maharashtra 413512, India
Nukala Valli Renuka, Department of Periodontics, Army College of Dental Sciences, Secunderabad 500087, India
Author contributions: Srikanth MD and Radhika B carried out the extra oral and intra oral examinations, the radiological investigations and the writing of the case report; Kiran M carried out the pre-surgical endodontics; Renuka NV carried out the pre-surgical oral prophylaxis and necessary periodontal investigations.
Correspondence to: Mandadi Dakshinamurthy Srikanth, Senior Lecturer, Department of Oral Medicine and Radiology, MNR Dental College and Hospital, MNR Nagar Fasalwadi, Sangareddy 502001, India. drsrikanthmd@rediffmail.com
Telephone: +91-984-9207997 Fax: +91-984-9207997
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Abstract

Ameloblastic carcinoma is a rare odontogenic tumor exhibiting histological evidence of malignancy in the primary or recurrent tumor. It is characterized by rapid, painful expansion of the jaw, unlike conventional ameloblastomas. The tumor most frequently involves the mandible. The expanding lesion causes perforation of the buccal and lingual plates of the jaw and invades the surrounding soft tissue. Rapidly growing large tumor mass may cause tooth mobility. A mandibular tumor involving the mental nerve leads to paresthesia of the nerve. A maxillary tumor can produce a fistula in the palate and paresthesia of the infraorbital nerve. Most ameloblastic carcinomas are presumed to have arisen de novo with a few cases of malignant transformation of ameloblastomas. Although rare, these lesions have been known to metastasize, mostly to the regional lymph nodes or lungs. A case of ameloblastic carcinoma in a 60-year-old man is reported here and its clinical, radiological and histological features are discussed.

Key words: Ameloblastic carcinoma; Squamous metaplasia

Core tip: Clinically, ameloblastic carcinoma is more aggressive than most typical ameloblastomas, with extensive local destruction, perforation of the cortical plate, extension into surrounding soft tissues, numerous recurrent lesions and metastasis, usually to cervical lymph nodes. Histologically, the tumor cells resemble cells seen in ameloblastoma but show cytological atypia, cellular pleomorphism, nuclear hyperchromatism, mitoses and vascular and neural invasion. These identifying features of ameloblastic carcinoma must be known and recognized by dental practitioners. It is probable that ameloblastoma, like other tumors (such as carcinoid tumors and epithelial tumors of the ovary), shows a spectrum of histological and biological behavior, ranging from benignity at one end to frank malignancy at the other.

Srikanth MD, Radhika B, Metta K, Renuka NV. Ameloblastic carcinoma: Report of a rare case. *World J Clin Cases* 2014; 2(2): 48-51 Available from: URL: http://www.wjgnet.com/2307-8960/full/v2/i2/48.htm DOI: http://dx.doi.org/10.12998/wjcc.v2.i2.48

INTRODUCTION

Malignant odontogenic tumors are very uncommon and ameloblastic carcinoma is a rare odontogenic carcinoma, with very few such cases being reported so far. The frequency of malignant change in ameloblastomas is difficult to establish but probably may be less than 1% among all cases of ameloblastomas[1].

The terminology for these lesions is somewhat controversial. The term malignant ameloblastoma should be used for a tumor that shows the histopathological

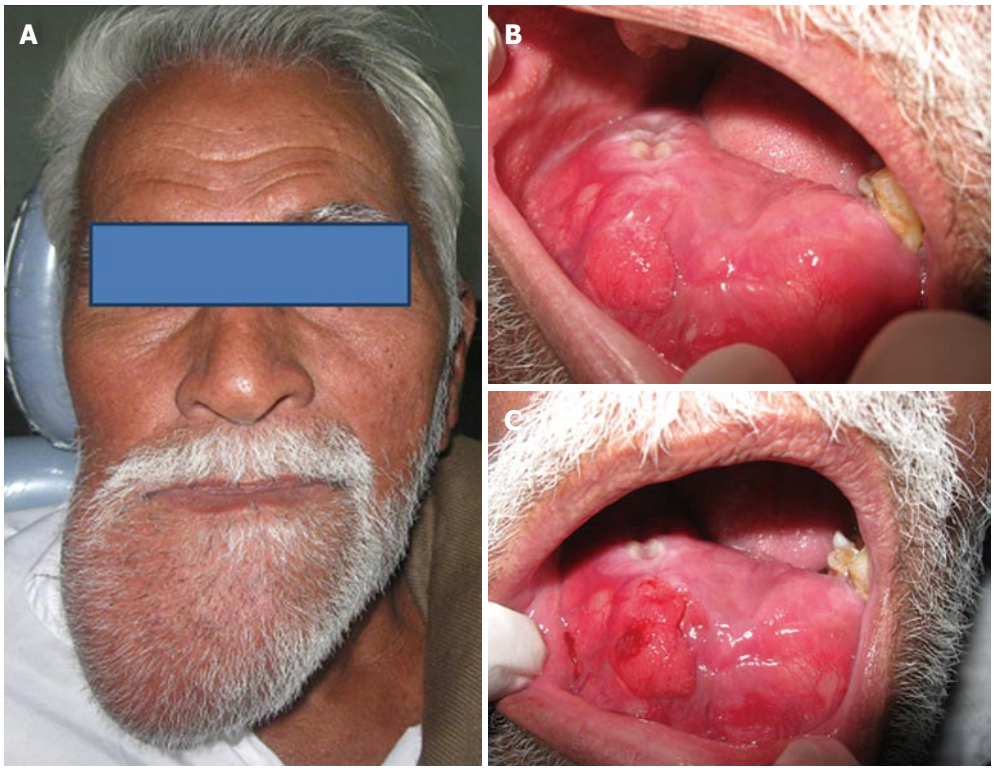

Figure 1 Extra (A) and intra oral photograph of swelling with labial, buccal and lingual cortical expansion (B, C).

features of ameloblastoma, both in the primary tumor and in the metastatic deposits[2]. However, the term ameloblastic carcinoma should be reserved for an ameloblastoma that has cytological features of malignancy in the primary tumor, in a recurrence, or in any metastatic deposit[3]. These lesions may follow a markedly aggressive local course but metastases do not necessarily occur[4].

Odontogenic carcinoma signifies the primary malignant epithelial tumors of the terms that are so poorly differentiated that they bear little or no resemblance to any of the odontogenic apparatus. With the presence of many clear cells in conjunction with the other patterns and histological features considered to be indicative of malignancy in these lesions and in keeping with the guidelines of World Health Organization (WHO) classification of odontogenic tumors, some authors even prefer to designate these tumors as clear cell ameloblastic carcinoma or ameloblastic carcinoma, clear cell variant.

CASE REPORT

A 60-year-old male patient came to the department of oral medicine and radiology with a chief complaint of swelling over the right side of the face for 10 years (Figure 1A). History revealed that he first noticed a small intra oral swelling at the labial aspect of lower right canine region which gradually increased in size. Initially he noticed pain in that region but subsequently but there was no pain and the swelling increased progressively to the present size. The patient also noticed development of paresthesia of the lower lip with pain over the swelling.

On examination, a huge extra oral swelling was found, measuring around 23 cm × 11.5 cm in size, extending from the right side of mandible and crossing the midline with well defined margins, hard in consistency, with tenderness over the swelling. Intra oral examination revealed complete obliteration of the buccal and labial vestibule on the right side, with the swelling extending in to the anterior region of the floor of the mouth (Figure 1B). It had a normal mucosal color and 31-33 and 41-47 teeth were missing. The intra oral swelling was hard in consistency and tenderness was present on palpation (Figure 1C).

In light of the above findings and the nature and duration of the lesion, a provisional diagnosis of ameloblastoma was considered and odontogenic myxoma and osteosarcoma were considered for a differential diagnosis.

The patient had an orthopantomograph (OPG), computed tomography (CT) mandible and magnetic resonance imaging. OPG showed huge multilocular radiolucency with the septa giving an appearance of a soap bubble or honeycomb extending from the ramus molar region on right side, crossing the midline to the lower left premolar region (Figure 2A). CT dental scan showed an enlarged tumor extending from the ramus region of 48 to the 35 region (Figure 2B). The tumor caused severe expansion of the buccal and lingual cortical plates with a multilocular appearance.

Excisional biopsy revealed numerous epithelial follicles spread out in a scanty connective tissue stroma. The epithelial nests showed typical (tall) columnar peripheral cells with apically placed nuclei and vacuolated cytoplasm. The central cells showed squamous metaplasia

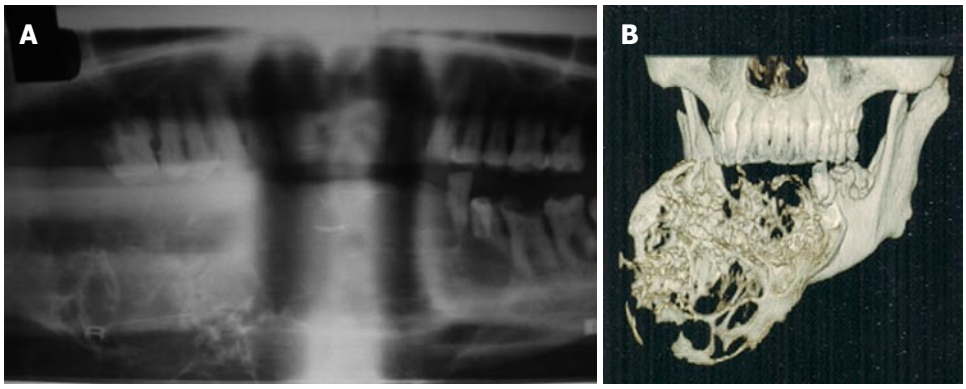

Figure 2 Orthopantomograph (A) and 3D computed tomography (B) showing honeycomb lesion.

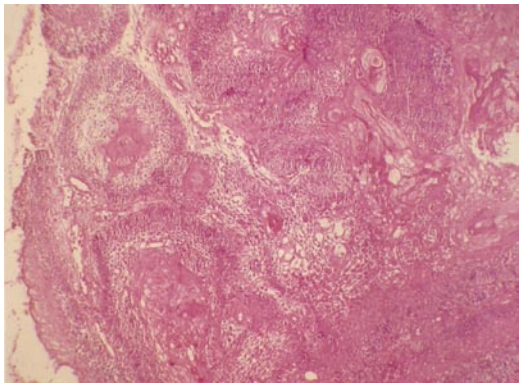

Figure 3 Histopathology specimen showing epithelial follicles with squamous metaplasia and numerous keratin pearls.

and numerous keratin pearls. A few cells showed features of dysplasia, such as irregular aggregation, cellular and nuclear pleomorphism with nuclear hyperchromasia (Figure 3).

The histological features were consistent with ameloblastic carcinoma. Myxomas radiologically show honeycomb variant and fine trabeculations within the small lobules not present in ameloblastoma. Osteosarcoma is a common primary malignant tumor affecting the jaw and radiologically a sunray appearance is present. Hence, they were excluded and a final diagnosis of ameloblastic carcinoma was made. The patient underwent surgical resection of the tumor by microvascular reconstructive surgery with complete resection of the mandible and reconstruction of the mandible was done by fibula graft (Figure 4). The patient is being followed up closely.

DISCUSSION

Ameloblastic carcinoma is a rare neoplasm that represents a challenge in its diagnosis, treatment and prognosis. Information regarding its clinical features is scanty[5]. The demographic data of ameloblastic carcinoma reported in the literature suggests that it is more common in males (M:F 1.5:1) and the site of distribution is in the mandible, particularly in the posterior mandible[1]. The age range of occurrence shows a large variation with an average age of 39.8 years. However, a few authors have stated that the sixth decade is the predominant age group. Ameloblastic carcinoma has been reported to arise either de novo or from a preexisting odontogenic cyst or ameloblastoma[5]. The common clinical signs and symptoms include swelling, pain, trismus and dysphonia[6] and there are several classifications: (1) WHO classification of odontogenic carcinomas: malignant ameloblastoma; primary intraosseous carcinoma; malignant variants of other odontogenic tumors; and malignant changes in odontogenic cysts; (2) Classification of odontogenic carcinomas according to Slootweg and Muller: primary intraosseous carcinoma, *e.g.,* odontogenic cyst (Type Ⅰ); malignant ameloblastoma (type ⅡA); ameloblastoma carcinoma, arising *de novo*, *e.g.,* ameloblastoma, or *e.g.,* odontogenic tumor (type ⅡB); and primary intraosseous carcinoma arising *de novo* (type ⅢA: non keratinizing; type ⅢB: keratinizing); and (3) LJ Slater, Oral and Maxillofacial Clinics of North America - odontogenic carcinomas: metastasizing ameloblastoma; ameloblastic carcinoma; carcinoma, *e.g.*, ameloblastoma; primary intraosseous carcinoma; solid; cystic (*e.g.*, odontogenic cyst); central mucoepidermoid carcinoma; ghost cell odontogenic carcinoma; and clear cell odontogenic carcinoma.

Odontogenic sarcoma: Ameloblastic fibrosarcoma

The diagnostic criteria of an ameloblastic carcinoma that differentiate from ameloblastoma are based on cytological atypia and an increased mitotic index[5]. The histological changes should include a higher proliferative index emphasized by higher mitotic activity, higher proliferating cell nuclear antigen expression and higher ki67, atypia such as nuclear pleomorphism and basilar hyperplasia, hyperchromatic nuclei of basaloid cells, and other features of malignancy, such as peripheral or perivascular invasion. This should be correlated with the clinical features. The four important characteristics include[5] growth rate, the propensity for ameloblastic carcinoma to perforate the cortex, pain, as a third of patients with ameloblastic carcinoma experience pain or discomfort, and sensory disturbance, such as paresthesia which is rare with ameloblastoma.

Ameloblastic carcinoma is an aggressive neoplasm

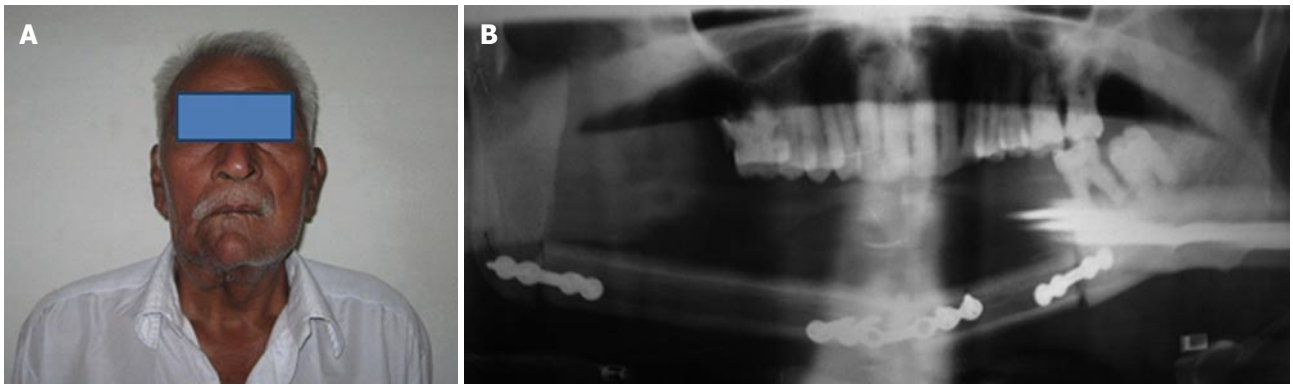

Figure 4 Post-op photograph (A) and orthopantomograph (B) of patient after surgical resection of the tumor by microvascular reconstructive surgery and reconstruction with a fibula graft.

that is locally invasive and can spread to regional lymph nodes or distant metastatic sites such as long bones. It is managed with wide local excision, elective or therapeutic neck dissection and post operative radiation therapy[5]. Radiotherapy and chemotherapy seem to be of limited value. The prognosis is poor and hence close follow up of the patient is needed.

Although the reported cases of ameloblastic carcinoma are scarce, the above features can be applied to diagnose an ameloblastic carcinoma at an early stage to enable early intervention and better treatment[7].

COMMENTS

Case characteristics

A case of ameloblastic carcinoma in a 60-year-old man is reported here and its clinical, radiological and histological features are discussed.

Imaging diagnosis

The patient had an orthopantomograph (OPG), computed tomography mandible and magnetic resonance imaging. OPG showed huge multilocular radiolucency with the septa giving an appearance of a soap bubble or honeycomb extending from the ramus molar region on right side, crossing the midline to the lower left premolar region.

Pathological diagnosis

Excisional biopsy revealed numerous epithelial follicles spread out in a scanty connective tissue stroma.

Treatment

The patient underwent surgical resection of the tumor by microvascular reconstructive surgery with complete resection of mandible and the reconstruction of the mandible was done by a fibula graft.

Experiences and lessons

It is probable that ameloblastoma, like other tumors (such as carcinoid tumors and epithelial tumors of the ovary), shows a spectrum of histological and biological behavior, ranging from benignity at one end to frank malignancy at the other.

Peer review

Ameloblastic carcinoma is a rare malignant tumor. This report is very interesting.

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3 **Tian D**, Araki H, Stahl E, Bergelson J, Kreitman M. Signature of balancing selection in Arabidopsis. *Proc Natl Acad Sci USA* 2006; In press

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6 21st century heart solution may have a sting in the tail. *BMJ* 2002; **325**: 184 [PMID: 12142303 DOI:10.1136/bmj.325.7357.184]

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9 Outreach: Bringing HIV-positive individuals into care. *HRSA Careaction* 2002; 1-6 [PMID: 12154804]

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10 **Sherlock S**, Dooley J. Diseases of the liver and billiary system. 9th ed. Oxford: Blackwell Sci Pub, 1993: 258-296

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11 **Lam SK**. Academic investigator's perspectives of medical treatment for peptic ulcer. In: Swabb EA, Azabo S. Ulcer disease: investigation and basis for therapy. New York: Marcel Dekker, 1991: 431-450

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15 Morse SS. Factors in the emergence of infectious diseases. Emerg Infect Dis serial online, 1995-01-03, cited 1996-06-05; 1(1): 24 screens. Available from: URL: http://www.cdc.gov/ncidod/eid/index.htm

Patent (list all authors)

16 **Pagedas AC**, inventor; Ancel Surgical R&D Inc., assignee. Flexible endoscopic grasping and cutting device and positioning tool assembly. United States patent US 20020103498. 2002 Aug 1

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