

Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.elsevier.com/locate/radcr

Case Report

Unusual finding of bronchopulmonary carcinoma through a pterygoid muscle metastasis. About a case[☆]

Amine Cherraqi, MD^{a,*}, Jihane EL Mandour, MD^a, Ola Messaoud, MD^a,
Yassir Benameur, MD^b, Rachid Tanz, MD PhD^c, Jamal El Fenni, MD PhD^a,
Rachida Saouab, MD PhD^a

^aRadiology Department, Mohammed V Military Hospital, Rabat, Morocco

^bNuclear medicine department, Mohammed V Military Hospital, Rabat, Morocco

^cOncology Department, Mohammed V Military Hospital, Rabat, Morocco

ARTICLE INFO

Article history:

Received 16 January 2022

Revised 9 June 2022

Accepted 11 June 2022

Keywords:

Muscle metastasis

Lung cancer

Diagnosis

Imaging

ABSTRACT

Bronchopulmonary cancer muscle metastases are uncommon, especially when they are visible. They can impact any muscle in the body, but the psoas, diaphragmatic, and paravertebral muscles have a clear advantage. We present a case of lateral pterygoid muscle metastasis of squamous cell carcinoma of the lung in a 70-year-old habitual smoker (40 packs per year) presents headaches more marked on the right and progressively worsening. A complementary brain MRI revealed a well-limited oval formation with irregular contours in hypo signal T1 hyper signal T2 heterogeneous, with area of central necrosis of the right pterygoid muscle, which was revealed to be a secondary location of bronchopulmonary malignancy after further examination (CT scan of the cervico-thoraco-abdomino-pelvic region, TEP scan, and biopsy). Moreover, muscle metastases are rarely revealing of primary cancer.

© 2022 The Authors. Published by Elsevier Inc. on behalf of University of Washington.

This is an open access article under the CC BY-NC-ND license

(<http://creativecommons.org/licenses/by-nc-nd/4.0/>)

Introduction

Skeletal muscles represent 50% of total body mass and require a good blood supply and a high cardiac output. However, hematogenous metastases to skeletal muscles are rare. Mus-

cular metastasis is mostly derived from lung carcinoma [1]. They can involve any muscles of the body but frequently localized in the psoas, diaphragmatic and paravertebral muscles [2]. We report a case of metastasis mass in the lateral pterygoid muscle from a squamous cell carcinoma of the lung.

Abbreviations: GCS, Glasgow coma scale; CT scan, Computed tomography scan; MRI, Magnetic resonance imaging; PET scan, Positron emission tomography; PH, Potential of hydrogen.

[☆] Competing Interests: All authors declare no conflict of interest.

* Corresponding author.

E-mail address: dr.amine.cherraqi@gmail.com (A. Cherraqi).

<https://doi.org/10.1016/j.radcr.2022.06.039>

1930-0433/© 2022 The Authors. Published by Elsevier Inc. on behalf of University of Washington. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>)

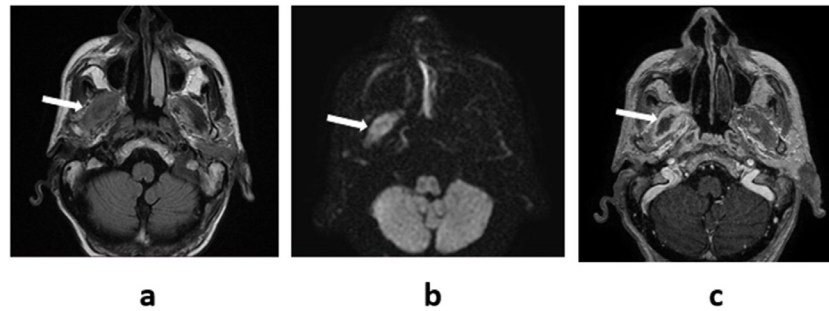


Fig. 1 – Axial sections of a cervical MRI showing an abnormality signal of the right lateral pterygoid muscle in heterogeneous intermediate signal in T2 Flair weighted sequence (a) (white arrow), in diffusion hypersignal (b) (white arrow), annularly enhancing in SpT1 after Gadolinium injection and containing a central necrosis area (c) (white arrow).

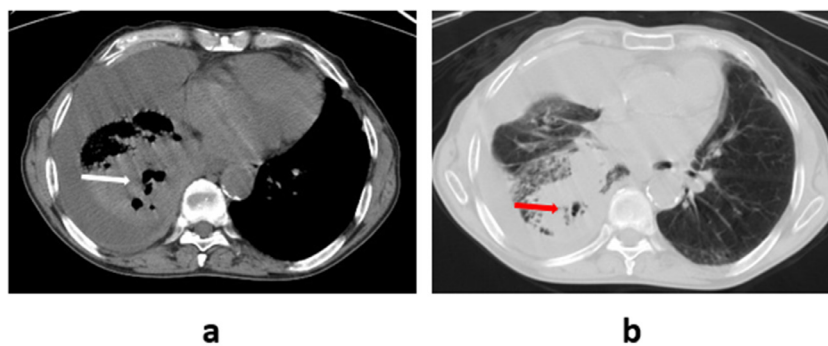


Fig. 2 – Chest CT in axial section (a = mediastinal window, b = parenchymal window): showing a right posterobasal lung mass with irregular contours and areas of necrosis, surrounded by a patch of ubiquitous confluent micronodules related to carcinomatous lymphangitis, associated with a pleurisy of moderate abundance.

Case report

A 70-year-old patient, chronic smoker (45 pack/year), presented with *headaches predominant on the right side with progressive worsening*. The clinical examination revealed a conscious patient in good general condition, GCS 15/15, stable vital signs, and with a normal neurological examination. A cerebral CT scan was performed and did not show any abnormality besides the presence of a fluid formation at the right lateral pterygoid muscle, with a peripheral moderate contrast uptake. A brain MRI was performed afterwards showing a well-defined oval mass within the right lateral pterygoid muscle, with irregular contours, hyposignal T1 and heterogenous hypersignal T2, containing an area of central necrosis, intensely enhancing in the periphery after injection of Gadolinium (Fig. 1). These radiological findings were suggestive of an abscess or a metastasis (Fig. 1). A cervico-thoraco-abdomino-pelvic CT scan was performed and showed the presence of a right posterobasal pulmonary tissue lesion process with irregular contours containing areas of necrosis, surrounded by micronodules and carcinomatous lymphangitis (Fig. 2). A scanno-guided biopsy of the lung mass confirmed the diagnosis of a squamous cell carcinoma of the lung (Fig 3). A PET scan showed a pathological hypermetabolism of the right lower lobe of the lung, SUVmax of the mass was estimated at 13, 2 and metabolic hyper-



Fig. 3 – Chest CT in mediastinal window in axial section shows the scanno-guided biopsy of the tumor.

fixation of the right lateral pterygoid muscle mass with an SUVmax at 9.5. These findings confirmed the diagnosis of right lateral pterygoid muscle metastasis of lung cancer (Fig 4). The patient underwent chemotherapy in the oncology department but died a few days later.

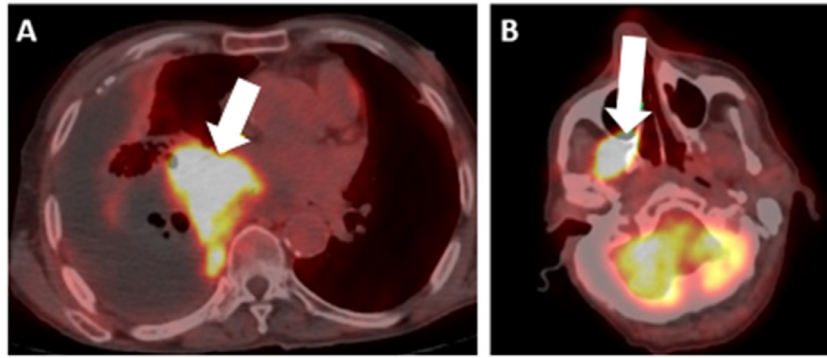


Fig. 4 – Axial slice PET scan image of the right posterobasal pulmonary process (white arrow) (a) and the right lateral pterygoid muscle lesion are (white arrow); (b) both hypermetabolized to the same degree.

Discussion

Muscle metastases are rare, although skeletal muscle is almost 50% of body mass, and is highly vascularized [3,4]. Their frequency varies according to the circumstances of discovery: in clinical series, muscle represents a metastatic site in 0.03%–0.16% of cancers, whereas in autopsy series, the frequency can reach 16% [5].

Some studies presented factors that were considered to help reduce the risk of malignancy in the skeletal muscle such as: moderate exercise, that helps by destroying muscle microvascularization rapidly during contraction and therefore reduce the risk of tumor formation; muscle pH and the ability of striated muscle to handle lactic acid secreted by the tumor thus preventing its neovascularization; changes in intramuscular arterial pressure or local temperature. The sarcolemma represents an effective barrier against tumor cells that could develop more easily in case of muscle trauma. In addition to these biomechanical processes, other muscle growth and regeneration factors could play a key role in slowing down tumor proliferation [2,6].

In addition to these factors, striated muscle can secrete a low molecular weight factor, called "MF", capable of inhibiting (in vitro and in vivo in mice) the implantation of most tumor lines. One of the most active components is adenosine A3, which represents a promising therapeutic prospect for oncology treatments in general. Recently, the role of A3 adenosine receptor agonists was proposed to explain the muscle resistance to metastasis. This antitumor factor potentially secreted by the muscle would exert a cytostatic rather than cytotoxic role on tumor cells by "blocking" them at the G0/G1 stage of their cell cycle. However, the efficacy of these antitumor factors depends also on the metastatic potential of the initial primary cancer: tumors with high metastatic potential would be more sensitive to the action of these factors than those with low metastatic potential [6].

Tumors with a high potential for muscle metastasis are, in order of frequency: carcinomas of different origins (pulmonary, breast, bronchial, thyroid, colonic and gastric), lymphomas and leukemias [3]. The histological type depends on the location of the primary cancer. For lung cancers, squamous cell carcinomas represent (44%), adenocarcinomas

(36%), small cell cancers (8%) and undifferentiated carcinomas (8%) [6].

Muscle metastases preferentially affect the diaphragm (67.8) [6]; the lower limbs (nearly 50% of cases); the psoas (29.4) [7]; the upper limbs (nearly 25% of cases). More rarely, the axial (18.25%) and cephalic (13.2%) musculature, unrelated to the location of the primary cancer [6]. The muscle metastasis is usually an isolated lesion (in 78% of cases), may be palpable (62.7%) and painful (61.25%). In fact, palpation of the lesion depends above all on its location: only lesions in the most superficial muscles can be palpated, the others remaining asymptomatic or causing local "discomfort". The painful character varies according to the location. The most painful metastatic localizations are the upper limbs (69.4% of cases) and the lower limbs (in 72.9% of cases); the axial musculature appears painful in only half of the cases, whereas 62.9% of the metastases of the muscles of the cephalic extremity are painless. Contractures are rarely described [6].

Muscle metastases rarely reveal the primary cancer; they often occur during the evolution of a known cancer. In fact, only 36.7% of them are clinically symptomatic before the discovery of the primary tumor. When the primary cancer is known, a muscle metastasis appears in more than half of the cases (58.6%) within 24 months of the discovery of the cancer (of which 76% within the first 6 months); more rarely, appears beyond 72 months (17.2% of the cases), with a delay that can sometimes reach 38 years [6].

There are no pathognomonic radiological criteria, therefore a histological confirmation is always required [8]. CT scan shows a heterogeneous mass within an enlarged muscle with areas of necrosis and peripheral contrast uptake [3]. On MRI, the metastasis appears as a nodular lesion of variable size in T1 hypo- or isosignal, hypo- or isointense compared to healthy muscle with areas of central necrosis in hypersignal in T2-weighted sequences [5,8], and moderate heterogeneous contrast uptake associated to soft tissue edema [4]. In our patient, the metastasis presented as a liquid formation with an enhanced wall after gadolinium injection.

The therapeutic management of muscle metastases is essentially based on surgery, radiotherapy and chemotherapy [9,10] depending on the primary location, other sites involved and the age of the patient [11].

The development of metastatic disease at an advanced stage of cancer usually represents a poorer prognosis, as these metastatic cells are resistant to most cancer treatments. Also, the percentage of survival at 24 months (after the discovery of a muscle metastasis) is only 13.8%. These data suggest that muscle metastases are most often related to primary cancers that are particularly advanced or of high grade of malignancy [6].

The prognosis of muscle metastases is péjorative as it is directly related to the prognosis of the primary lesion [9,11].

Conclusion

Muscle metastases are rare. They rarely reveal the primary cancer. Radiological findings are not specific, the diagnosis is confirmed by histological study. Their treatment is not codified and must take into account the patient's general state and the primary cancer.

Patient consent statement

Written informed consent for publication was obtained from patient.

REFERENCES

- [1] Magee T, Rosenthal H. Skeletal muscle metastases at sites of documented trauma. *AJR Am J Roentgenol* 2002;178 doi:11906887. doi:10.2214/ajr.178.4.1780985.
- [2] Lahfidi A, Zaimi S, En Nafaa I, El Fenni J, Saouab R. Low back pain indicative of psoas muscle metastasis and bronchopulmonary cancer. *Radiol Case Rep* 2020;15(9):1689–92 PMID: 32742529; PMCID: PMC7387733. doi:10.1016/j.radcr.2020.06.038.
- [3] Koike Y, Hatori M, Kokubun S. Skeletal muscle metastasis secondary to cancer a report of seven cases. *Ups J Med Sci* 2005;110(1):75–83.
- [4] Kamal M, Touiti D, Jouhadi H, Benider A. Iliopsoas metastasis from cervix carcinoma masquerading as psoas abscess. *J Cancer Sci Ther* 2012;4(4):75–6.
- [5] Tuoheti Y, Okada K, Osanai T, Nishida J, Ehara S, Hashimoto M, et al. Skeletal muscle metastases of carcinoma: a clinicopathological study of 12 cases. *Jpn J Clin Oncol* 2004;34(4):210–14.
- [6] Mathis S, Fromont-Hankard G, du Boisguéheneuc F, Godenèche G, Mahieu F, Balaboi I, et al. Les métastases des muscles striés [Muscular metastasis]. *Rev Neurol (Paris)* 2010;166(3):295–304 FrenchEpub 2009 Sep 3. PMID: 19732922. doi:10.1016/j.neurol.2009.05.020.
- [7] Menard O, Parache RM. Les métastases musculaires des cancers. *Ann Med Intern* 1991;142(6):423–8.
- [8] Sakurai H, Mitsuhashi N, Takahashi M, Akimoto T, Muramatsu H, Ishikawa H, et al. Analysis of recurrence of squamous cell carcinoma of the uterine cervix after definitive radiation therapy alone: patterns of recurrence, latent periods, and prognosis. *Int J Radiat Oncol Biol Phys* 2001;50(5):1136–44.
- [9] George J, Lai FM. Metastatic cervical carcinoma presenting as psoas abscess and osteoblastic and lytic bony metastases. *Singapore Med J* 1995;36(2):224–7.
- [10] Devendra K, Tay SK. Metastatic carcinoma of the cervix presenting as a psoas abscess in an HIV-negative woman. *Singapore Med J* 2003;44(6):302–3.
- [11] Surov A, Hainz M, Holzhausen HJ, Arnold D, Katzer M, Schmidt J, et al. Skeletal muscle metastases: primary tumours, prevalence, and radiological features. *Eur Radiol* 2010;20(3):649–58.