

Ultrasound-guided fine needle aspiration biopsy (FNAB) demonstrating upper distal extremity metastasis of lung adenocarcinoma: a case report and review of the literature

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Abstract. – Due to early metastasis and delayed diagnosis, lung cancer is the leading cause of cancer-related deaths. Although the most common metastasis sites are brain, bone, lung, adrenal glands, liver, and extra-thoracic lymph node, soft tissues, such as skeletal muscles, skin, and subcutaneous tissues, can also be undermined. This article aims to report the first case of an asymptomatic radial extensor muscle metastasis generating from a lung adenocarcinoma that was diagnosed by ultrasound-guided fine-needle aspiration biopsy (FNAB).

Key Words:

FNAB eco-guided, Soft tissue metastasis, Distal extremities, Lung cancer, Cell block.

Introduction

Case Presentation

In September 2020, a 77-years-old man was admitted to our Oncology Inpatients Unit to undertake a lung adenocarcinoma follow-up. The tumor had been diagnosed 3 years before and was treated with chemotherapy. Since a laryngeal carcinoma had already been surgically treated 30 years before, remote medical history

was taken into account. Compared to the one performed 6 months earlier, the CT scan made in February 2020 had showed disease progression. Moreover, during the previous 2 months, the appearance of a painless pericentimetric nodule on the left forearm had been noted by the patient. No other skin lesions or palpable lymph nodes were detected. Arm MRI scan demonstrated an alleged malignant lesion measuring 1.5 cm x 1.0 cm, located in the musculotendinous structures in the posterior compartment of the left distal forearm area (extensor fingers), over the hand-wrist-forearm dorsum (Figure 1A-B). Under aseptic precautions, an ultrasound-guided fine-needle aspiration biopsy (FNAB) was then performed. To enhance the diagnosis and minimize complications, a dedicated probe with a central hole was employed, following the “modified Menghini” technique (*Biomol Hospital Service, Italy*) (Figure 1C). According to this method, a label with a centimeter scale is applied on a 20-gauge needle to obtain the highest precision (Figure 1D-E). This technique allows real-time visualization of the needle, and the acquisition of cytologic samples (Figure 1F), and it is also useful for cell blocks (CB) preparation¹ (Figure 1G). A 1:1 Calcium chloride and plasma solution was added to the fluid sample obtained

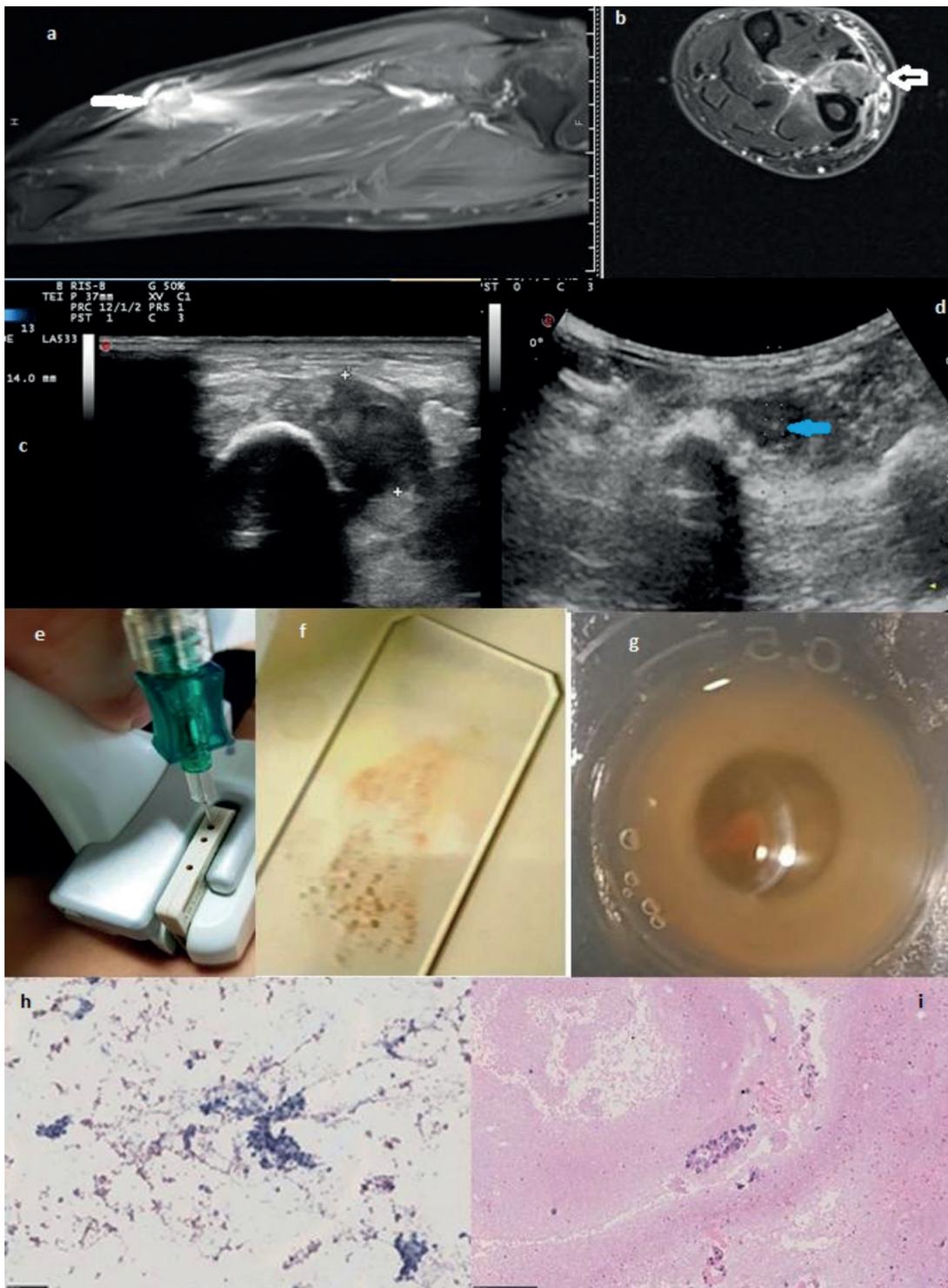


Figure 1. Coronal (A) and axial (B): MRI scan demonstrated a suspected malignant lesion measuring 1.5 cm × 1.0 cm in the context of musculotendinous structures in the posterior compartment of the left distal forearm (extensor fingers) over the dorsum of the hand- wrist-forearm (*white arrow*). Ultrasound scan with linear probe at 12 MHz (C) and dedicated convex probe at 8 MHz (D) of suspected malignant lesion measuring 1.4 cm in the context of musculotendinous structures in the posterior compartment of the left distal forearm (extensor fingers) over the dorsum of the hand- wrist-forearm. E, Ultrasound convex transducers with a central hole for needle passage. F, The sample on the cytology slide. G, Cytological sample for Cell Block preparation; Low power smear magnification (H) shows clusters of neoplastic cells whereas, on high power cell block magnification (I), acinar features favoring adenocarcinoma are observed.

from FNA. Once a clot took shape, 10% buffered formalin was added. The solidified clot was then automatically processed and embedded in paraffin. CB sections were prepared and stained with hematoxylin and eosin. During the smear and cell block microscopic examination, adenocarcinomas cells consisting of pulmonary primitivity were observed (Figure 1H-I). Due to the advanced disease stage, surgical treatment was excluded, and intensity-modulated radiotherapy was instead performed on the forearm nodule (20Gy).

Discussion

Skeletal muscle metastasis as lung cancer manifestation is a rare phenomenon that is often recognized during autopsy only. The rarity of skeletal muscle metastases is ascribed to metabolite accumulation (such as free oxygen radicals and lactic acid), low pH environment, mechanical stimulus, unstable blood flow, and tissue pressure². Thigh, ilio-psoas, and paraspinous muscles are the commonly concerned sites of clinical involvement reports. Advanced radiology techniques such as MRI and PET-CT are necessary for skeletal muscle metastasis when clinical concerns arise. The diagnosis demonstration is based on the histologic examination, usually acquired by a surgical approach. Ultrasonography (US) is a non-invasive tool increasingly used for the early recognition of musculoskeletal and soft-tissue masses and for US-guided biopsy, thanks to its feasibility and viable costs³. The US-guided biopsy includes both fine needle aspiration (FNA) and core needle biopsy. In particular, FNAB is safer and less traumatic than an open surgical biopsy. In addition, it is also reliable and safe when performing biopsies in critical body areas is required⁴. This technique implies the insertion of a fine hollow needle in the lesion and the application of a syringe meant to draw the material needed for cytologic and/or cultural examination⁵. CB routinely used in the cytology of body fluids can also be used in FNA material with a considerable enhancement in diagnostic accuracy. In addition, CB sections are also suitable for ancillary techniques, such as histochemical stains and immunocytochemistry. Despite its several benefits (minimal invasiveness, diagnostic speed, sustainability, safety, the possibility to be applied in an outpatient scenario, and the other advantages previously

discussed), FNAB has rarely been reported. Nevertheless, the diagnostic accuracy of FNAB/cytology may vary depending on the operator skill and on the quantity of tissue collected. The FNAB employment on distal extremities masses and swellings is extremely difficult to track in the existing literature. In addition, it has to be underlined that the common onset of muscular metastasis manifests through pain (either with swelling or not), while the patient was absolutely asymptomatic. Despite having reviewed 141 cases in which FNAB was used in the upper and lower distal extremities region⁶, neither a case entailing metastasis in that area, nor sufficient data regarding bioptic procedure types and stages could be found. Only 8 papers⁷⁻¹⁴ analyzed during the review referred to lung cancer metastasis in the upper limb muscles, but none reported the presence of metastasis in the distal extremities (hand and wrist). Triceps, biceps, and deltoid were indeed the most commonly involved muscles (Table I). The studies eventually showed that FNAB cell block was never applied in order to formulate a diagnosis. Therefore, the case is unique according to different aspects: not only the kind of lung cancer metastasis is rare, but this case also represents the first literature-reported phenomenon of secondary localization in the distal extremities. Compared to the traditional surgical approach, the use of an eco-guided biopsy, whether to exclude or confirm the malignant nature of an alleged muscular lesion, highlights a low degree of invasiveness and riskiness in formulating the diagnosis. Moreover, this is especially efficient when an early and asymptomatic phase (as it was our patient) is considered.

Conclusions

The presence of muscle metastases should always be suspected in lung cancer patients affected by palpable masses, whether painful or asymptomatic. In our report, none of the cases reviewed had showed the use of FNAB/cell block for a definitive diagnosis. Although this approach is extremely operator-dependent, in the last few years, the performance of US-guided fine-needle biopsy has been revealed to be very convenient since it is a diagnostic micro-invasive technique that should be suggested as the first approach. As far as our knowledge is concerned, this is the first case report of lung cancer metastasis involved the

Table 1. The types of bronchogenic neoplasms consisted of 14 primary adenocarcinomas (AD), 12 squamous cell carcinomas (SCC), 1 large cell carcinomas (LCC), 1 small cell carcinoma (SmCC), 6 primary “atypical” forms [3 undifferentiated (UD) and 3 sarcomatoid (SC)].

	Soft tissue metastasis muscle	Type of lung cancer	Type of diagnostical biopsy
Sariaydin et al (2016) ⁷ N = 1 case	Right biceps muscle	AD	Ultrasound-guided tru-cut biopsy
Agrawal et al (2013) ⁸ N = 1 case	Trapezius, right brachioradialis, deltoid and right external oblique muscles	SCC	Not specified
Daniel Pop et al (2009) ⁹ N = 16 cases Razak et al (2007) ¹⁰ N = 1 case	Muscles of the chest wall, abdominal wall, lower limb and upper limb Left triceps muscle	AD (7), SCC (4), SC (3), UD (1), LCC (1) SCC	Not specified Incisional biopsy
Combalia et al (2004) ¹¹ N = 1 case	Biceps muscle	SCC	Excisional biopsy
Di Giorgio et al (2004) ¹² N = 3 cases reviewed N = 9 cases	Intercostal, dorsal, neck and back muscles Left major dorsal muscle Left biceps muscle, paravertebral muscles deltopectoral, quadriceps, right biceps, thigh, left deltoid	AD SCC SmCC SCC (3) AD (4), UC (2)	Excisional biopsy Excisional biopsy Excisional biopsy Case reviewed: CT-guided biopsy, MRI visualization, or surgical exploration
Sridhar et al (1987) ¹³ N = 3 case	-Right iliacus muscle and gluteal muscles -Right biceps Biceps muscle	AD (2) SCC	Needle aspiration
Pellegrine (1979) ¹⁴ N=1 case	Medial head of the left triceps	SCC	Excisional biopsy

radial extensor muscle of the carpus. Furthermore, the peculiarity of our case lies in the detailed description of all steps of the FNAB eco-guided procedure performed for the suspected lesion histological diagnosis.

Conflict of Interest

The Authors declare that they have no conflict of interests.

Acknowledgements

We are grateful to our University and Hospital for supporting this study, and we also thank our ultrasonic team for having worked so hard on the project.

References

- 1) Parente P, Zanelli M, Zizzo M, Carosi I, Di Candia L, Sperandeo M, Lacedonia D, Fesce VF, Ascani S, Graziano P. Primary pulmonary Hodgkin lymphoma presenting as multiple cystic lung lesions: diagnostic usefulness of cell block. *Cytopathology* 2020; 31: 236-239.
- 2) Plaza JA, Perez-Montiel D, Mayerson J, Morrison C, Suster S. Metastases to soft tissue: a review of 118 cases over a 30-year period. *Cancer* 2008; 112: 193-203.
- 3) Sperandeo M, Trovato FM, Melillo N, Dimitri L, Musumeci G, Guglielmi G. The role of ultrasound-guided fine needle aspiration biopsy in musculoskeletal diseases. *Eur J Radiol* 2017; 90: 234-244.
- 4) Orlandi D, Sconfienza LM, Lacelli F, Bertolotto M, Sola S, Mauri G. Ultrasound-guided core-needle

- biopsy of extra-ocular orbital lesions. *Eur Radiol* 2013; 23: 1919-1924.
- 5) Exner GU, Kurrer MO, Mamisch-Saupe N, Cannon SR. The tactics and technique of musculo-skeletal biopsy. *EFORT Open Rev* 2017; 2: 51-57.
 - 6) Jakowski JD, Mayerson J, Wakely PE. Fine-needle aspiration biopsy of the distal extremities: a study of 141 cases. *Am J Clin Pathol* 2010; 133: 224-231.
 - 7) Sariaydin M, Günay E, Ulasli SS. An unusual metastasis of lung adenocarcinoma: biceps brachii muscle. *Lung India* 2016; 33: 669-671.
 - 8) Agrawal K, Bhattacharya A, Singh N, Harisankar CN, Mittal BR. Skeletal muscle metastases as the initial manifestation of an unknown primary lung cancer detected on F-18 fluorodeoxyglucose positron emission tomography/computed tomography. *Indian J Nucl Med* 2013; 28: 34-35.
 - 9) Pop D, Nadeemy AS, Venissac N, Guiraudet P, Otto J, Poudenx M, Mouroux J. Skeletal muscle metastasis from non-small cell lung cancer. *J Thorac Oncol* 2009; 4: 1236-1241.
 - 10) Razak AR, Chhabra R, Hughes A, England S, Dilley P, McMenemin R. Muscular metastasis, a rare presentation of non-small-cell lung cancer. *MedGenMed* 2007; 9: 20.
 - 11) Combalia A, Sastre S, Casas F. Lung carcinoma with metastasis to biceps muscle: report of a case and review of literature. *Eur J Orthop Surg Traumatol* 2004; 14: 172-176.
 - 12) Di Giorgio A, Sammartino P, Cardini CL, Al Mansour M, Accarpio F, Sibio S, Di Seri M. Lung cancer and skeletal muscle metastases. *Ann Thorac Surg* 2004; 78: 709-711.
 - 13) Sridhar KS, Rao RK, Kunhardt B. Skeletal muscle metastases from lung cancer. *Cancer* 1987; 59: 1530-1534.
 - 14) Pellegrini AE. Carcinoma of the lung occurring as a skeletal muscle mass. *Arch Surg* 1979; 114: 550.