Solitary fibrous tumour presenting with a single bone metastasis: report of six cases and literature review

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Abstract

Background: Solitary fibrous tumour (SFT) is a rare soft tissue sarcoma with a low metastatic potential. A higher metastatic rate is observed in the high-grade/dedifferentiated variant. The most common expected site of distant spread are the lungs and the liver. Bone involvement is generally viewed as a late stage of disease spread. We report on a retrospective series of SFT patients relapsing with a single distant bone recurrence as first metastatic event, without evidence of other organ involvement.

Case presentation: All patients affected by a single distant bone metastasis from SFT as first distant event, without any evidence of other site of metastasis, observed at our Institution, were considered. Bone involvement from SFT was pathologically assessed in all cases and confirmed by expert pathologists. A total of six patients were retrospectively identified. Primary tumour arose from the meninges in four patients, from soft tissues in two. Bone metastases were located to the vertebrae, the hip, the acetabulum and the rib. In all cases, bone relapse was the first event, with one patient presenting a local relapse. Median time from the primary tumour and the evidence of bone relapse was 40 months (range 0–58). In 2/6 patients bone metastasis was treated with radiotherapy (RT), in 2/6 with surgery, in 2/6 with surgery plus RT. At a median follow-up of 55 months (range 23–88), 5/6 patients are alive (2/5 without disease, 3/5 with multicentric metastatic disease) and one is dead of disease. 2/6 patients did not relapse after the treatment of the bone metastasis.

Conclusions: This small series in a relatively rare histology suggests that isolated, possibly late, bone metastases are a plausible scenario, in particular in meningeal SFT. Notably, new bone lesions in a patient with a history of SFT should always be investigated. Exclusive local treatments may be an option, though collection of such series would be needed to define the best treatment strategy.

Keywords: Sarcoma, Solitary fibrous tumour, Hemangiopericytoma, Metastasis, Prognosis, Bone

Background

Solitary fibrous tumour (SFT) is a very rare sarcoma, most frequently occurring in middle-aged patients. SFT can occur in several anatomic sites like meninges, periosteum, head and neck, extremities, and viscera [1–3].

Recently also primary SFTs arising from the bone have been reported [4]. SFT is characterized by a specific NAB2–STAT6 gene fusion which is responsible for the nuclear expression of the chimeric oncoprotein STAT6, which is the immunohistochemical hallmark of SFT [5–8] and helps in differential diagnosis. Of note, dedifferentiated SFT may lose the protein expression while retaining the fusion gene [9]. SFTs are known for the low tendency of recurrence and the low metastatic potential after complete resection (10–15 %), even if a higher metastatic rate...
(40%) has been described in case of pleomorphic/dedifferen-
tiated SFT [10, 11]. Recurrence may happen many
years after the initial diagnosis [12]. As for all other sar-
comas, the most frequent and initial site of metastasis
is the lung, followed by the liver [13]. Bone involve-
ment is reported in the late phase of the disease, in patients
already affected by lung lesions [12].

We report on a retrospective series of SFT patients
who suffered from a single distant bone recurrence as
their first metastatic event, without evidence of any other
organ involvement.

Case presentation
From May 2014 to April 2016 at the Fondazione IRCCS
Istituto Nazionale Tumori Milan, Italy, we observed
five patients with a diagnosis of SFT relapsed with sin-
gle bone metastasis plus an additional case whose bone
metastasis was synchronous to the primary tumour.

Bone involvement from SFT was pathologically
assessed in all cases and final diagnosis of bone relapse
from SFT was confirmed by expert pathologists bas-
ing on morphologic and immunohistochemical features,
with STAT6 nuclear immunopositivity, and by compar-
ing the metastatic tissue with the primary tumour.

Disease status was assessed in all the patients by whole
body CT scan, MRI and/or CT of the primary tumour
site. A bone scan ruled out the presence of other meta-
static bone lesions (Fig. 1).

Patient characteristics are summarized in Table 1. Pri-
mary SFT arose from the meninges in four patients, while
in the soft tissues of the left thigh and left gluteus in two.
Pathological centralized review of the primary tumour
confirmed a diagnosis of malignant SFT in all the cases
but one that was consistent with a classic SFT. The bone
lesions were all consistent with a diagnosis of malignant
SFT, with evidence of progression from a classic SFT
towards a malignant SFT in one (Figs. 2,3).

Bone metastases were mainly detected by the clinical
complaint of pain, since a bone scan was not foreseen in
the follow-up plan of these patients. Median time from
the primary tumour diagnosis and the evidence of bone
relapse was 40 months (range 0–58). In five cases, bone
relapse was the first event while one patient presented
with a synchronous single bone lesion (case 6 in Table 1).

All the patients received a definitive treatment of the
bone lesion, with curative intent. A complete surgical
resection of the bone metastasis was performed in four
cases, followed by complementary radiotherapy in two
cases. Radiotherapy was given in two cases.

At a median follow-up of 55 months (range 23–88),
five of six patients are alive (2/5 without disease, 3/5
with multicentric metastatic disease) and one is dead of
disease. Two of six patients (one treated with definitive
RT and one with surgery plus RT) did not suffer of any
tumour relapse after the treatment of the bone meta-
stasy, at a follow-up of 51 and 56 months (Table 1).

Discussion
This retrospective analysis reports on a series of six
patients affected by a single solitary bone metastasis
from SFT as first metastatic event. This small series in a
relatively rare histology shows that isolated, possibly late,
bone metastases are a plausible scenario, in particular in
meningeal SFTs.

All patients were treated with a curative intent. Two of
them are still disease free at 51 and 56 months.

In the literature, the most common sites of metastasis
in SFT patients were reported to be the lung and the liver
[12, 14–31]. In addition, there are few case reports of
SFTs, mostly arising from the meninges and pleura, pre-
senting with multiple late distant bone metastases that
followed the prior evidence of lesions located to the lung
and to the liver. To our knowledge there are only two
reports of SFTs relapsed with a single late bone meta-
tasis and no extra-skeletal [32, 33]. Notably in both cases
primary tumour was located to the meninges.

Our study confirms that isolated bone metastasis can
occur in SFT. To note, in our series, in two of four cases
the primitive tumour arose from the soft tissue.

Recently also primary SFT arising from the bone have
been reported [26]. In case of a single bone lesion con-
sistent with SFT a past or present primary tumour needs
always to be ruled out.

In our series, median time from the primary tumour
and the appearance of bone relapse was about 3 years,
while published cases are reported after a long interval
from the primary [32, 33].
| Case no | Age/sex | Primary tumour | Bone metastasis | Treatment | Status at last follow-up | OS (months) |
|---------|---------|----------------|-----------------|-----------|--------------------------|-------------|
|         |         |                | Site | Diagnosis | STAT6 (IHC) | Surgery | RT | Path diagnosis | IHC STAT6 | Time from primary and bone relapse (month) | Site of relapse | Time to relapse from bone met |         |
| 1 | 38/M | Meninges | Malignant SFT | Pos | Yes | No | 7° left rib | Malignant SFT | Pos | 50 | Complete surgery | Bone | 84 | AWD | 88 |
| 2 | 40/M | Meninges | Malignant SFT | Pos* | Yes | Yes | S3–S4 vertebra | Malignant SFT | Pos | 27 | Palliative RT | Bone and lung | 30 | AWD | 35 |
| 3 | 24/M | Meninges | Malignant SFT | Pos* | Yes | Yes | Hipbone | Malignant SFT | Pos | 58 | Complete surgery and RT | Bone | 78 | AWD | 79 |
| 4 | 26/F | Meninges | Malignant SFT | Pos | Yes | Yes | C4–C5 vertebrae | Malignant SFT | Pos | 48 | Complete surgery and RT | NA | NA | NED | 51 |
| 5 | 71/F | Deep soft tissue of left thigh | Malignant SFT | Pos | Yes | No | Left acetabulum | Malignant SFT | Pos | 54 | Definitive RT | NA | NA | NED | 56 |
| 6 | 66/M | Deep soft tissue of left gluteus | Classic SFT | Pos | Yes | No | 4° right rib | Malignant SFT | Pos* | 0 | Complete surgery | Lung | 12 | DOD | 23 |
All our patients received a local treatment of the bone metastasis with a curative intent. This could be considered an overtreatment as the standard of care for bone metastasis is offered with a palliative intent. Curative surgery was selected in four patients, followed by complementary radiotherapy in two cases (cases 3, 4, Table 1), while radiotherapy was given in two cases. However, it is interesting to note that in two cases with a prolonged follow-up the tumour has not yet relapsed. Yet to be confirmed on a larger prospective series, this suggests that in case of single bone metastasis a local treatment with curative intent may be an option.

In addition, in one of the two cases, the selected treatment was definitive RT alone suggesting that radiation treatment can be an alternative to surgery when morbidity is an issue. No patients received a systemic treatment for the single bone lesion; chemotherapy was given later in two patients who relapsed to multiple sites. SFTs show a low sensitivity to conventional cytotoxic chemotherapy [34, 35]. Recently, systemic therapy has focused on molecularly targeted therapies reporting some activity of antiangiogenics (bevacizumab in combination with temozolomide, sorafenib, sunitinib and pazopanib) [35–37].

There is no consensus on the optimal routine follow-up policy of sarcomas [38]; although SFTs presenting with a single bone metastasis seem to be relatively rare, this series suggests that a bone scan should be included in the staging of SFT patients and in case of bone pain in a patient with a history of SFT.

In one case we observed a bone lesion progressing towards a more aggressive variant of SFT. This underlies once more the limits of the classification available to date [39]. None of our cases showed, at the time of the skeletal progression, a biological shift to a high-grade dedifferentiated SFT. However, some of the cases showed an initial loss of STAT6 nuclear positivity in the bone metastasis, suggestive for a more aggressive potential. It is now described in the literature that immunohistochemical positivity for STAT6 may be lost in some SFTs while the fusion NAB2–STAT6 is retained [9]. To rule-out SFT diagnosis in these cases the demonstration of translocation is needed.

**Conclusion**

This small series in a rare sarcoma subtype suggests that isolated, skeletal metastases are a possible event in both meningeal and extrameningeal SFTs. On this basis bone lesions or symptoms in a patient with a history of SFT should be always investigated. Potentially curative local treatments may be an option, although a larger series is needed to define the best treatment strategy for such patients.
reviewed and edited the manuscript. All authors read and approved the final manuscript.

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Competing interests
The authors declare that they have no competing interests.

Availability of data and supporting materials
The authors are happy to share their data for research purpose. Please contact the corresponding author in case.

Consent for publication
Written informed consent was obtained from the patients for publication of this Case Report and any accompanying images.

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