Journal of BUON **14:** 507-510, 2009

Chemoembolization facilitates limb salvage surgery in stage III soft tissue sarcoma

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Summary

A 26 year-old male was referred to our unit because of a stage III soft tissue sarcoma in the shoulder girdle-axillary area and reduced forearm-distal arm strength. Imaging studies revealed that the tumor encompassed the axillary artery and brachial plexus. We chemoembolized it using vincristine, adriamycin and cyclophosphamide (VAC) plus gel foam and performed limb salvage surgery (LSS) afterwards. The patient received adjuvant chemotherapy (ifosfamide/mesna, adriamycin, and dacarbazine/MAID) and finally radiation therapy (RT; 6500 cGy total dose). Thirty-six months after the operation the patient remains free of disease, without local recurrence and excellent neurological recovery and functional rehabilitation. In stage III soft tissue sarcomas, especially in proximity with major nerve/arterial bundles, a multimodality approach is mandatory; chemoembolization is very effective in shrinking the tumor and defining its margins so as to make feasible a LSS.

Key words: chemoembolization, limb salvage, soft tissue sarcoma

Introduction

Soft tissue sarcomas are rare tumors. They constitute approximately 1% or less of all malignancies [1,2] and fibrosarcomas of the extremities constitute about 5-10% of soft tissue sarcomas [2,3]. There is evidence to support the use of chemoembolization in soft tissue sarcoma as an effective neo-adjuvant treatment [4,5]. This may be very important in difficult cases like in large sarcomas, especially if they abut major neurovascular structures. In this case report we present a young male with a large, high-grade fibrosarcoma (AJCC stage III) of the shoulder girdle-axillary area, who received chemoembolization in order to facilitate limb salvage surgery.

Case presentation

A 26-year-old man was referred to our unit with a big, palpable mass in the shoulder girdle, present there for 4 years. He also had reduced forearm and distal arm strength, with total inability of finger extension (radial nerve palsy) and great disability in grasping objects (medial nerve palsy). Computed tomography and magnetic resonance imaging showed an inhomogeneous soft tissue lesion in the right shoulder and axilla with biggest diameter 12 cm, without bone involvement (Figure 1). An arteriography was performed; the lesion encompassed the axillary artery and exhibited intense vascularity. In order to ascertain the nature of the lesion, we performed a fine needle biopsy that yielded positive results for soft tissue sarcoma. The proximity and possible encroachment to major vascular/neural bundles rendered the surgical excision of this tumor extremely hazardous. In order to shrink and downstage the tumor, our interventional radiologist proceeded to chemoembolization with VAC and gel foam (Figures 2-4). Afterwards, a limb-sparing surgery was performed; the tumor was widely excised in the greatest part of its surface and

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Received 02-10-2008; Accepted 22-12-2008

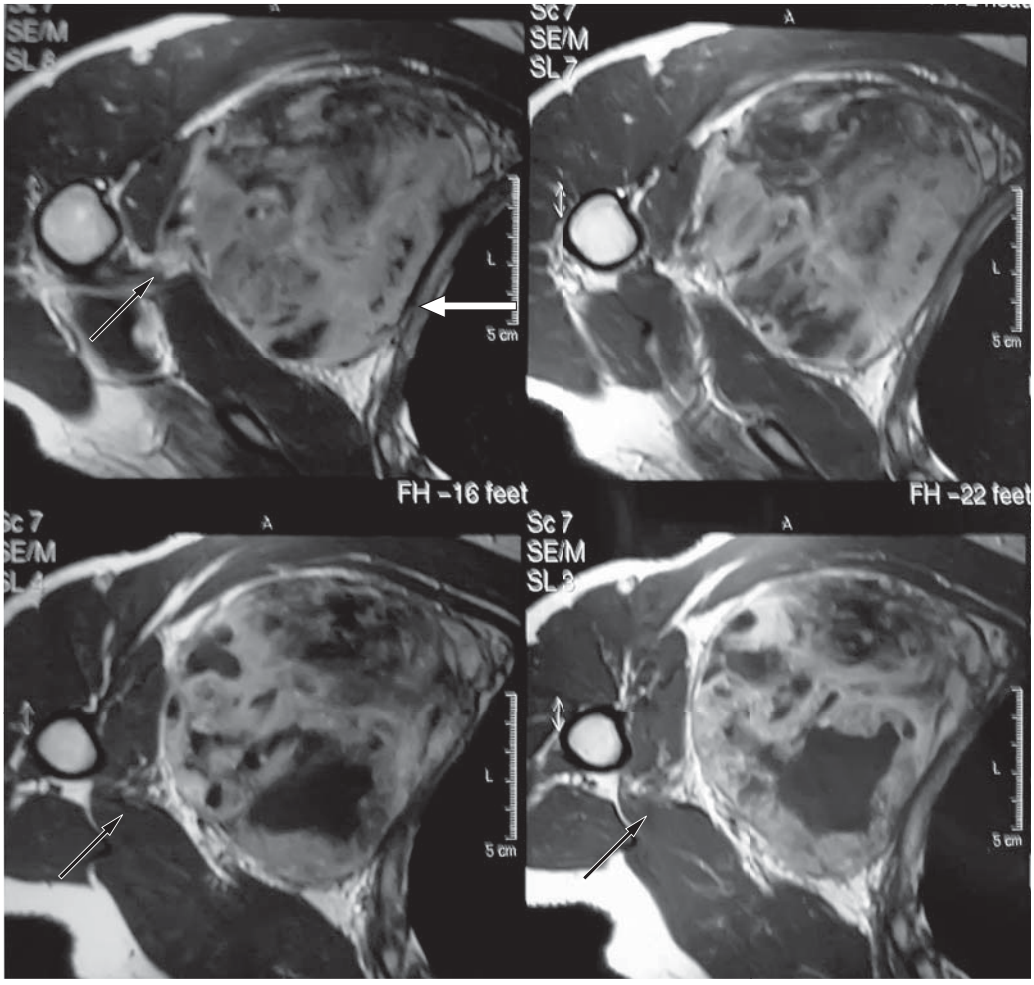

Figure 1. Axial MR images; T1 sequence without fat saturation after intravenous gadolinium. Heterogeneous tumor in the axilla abutting the chest wall (white arrow) and the neurovascular bundle (black arrows).

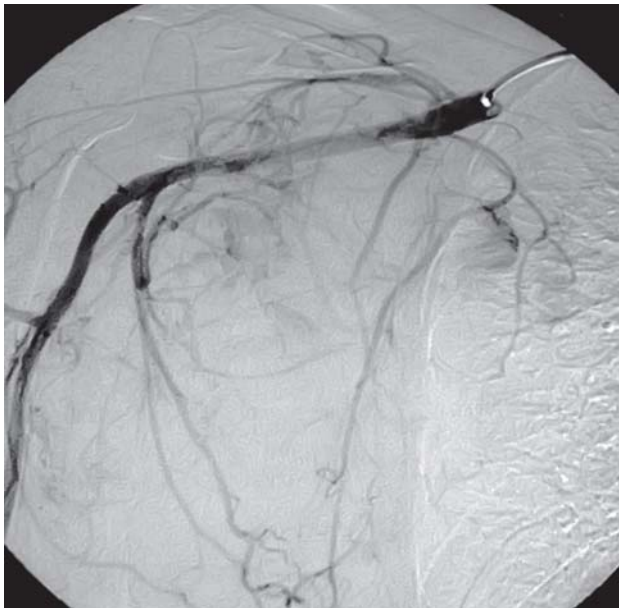

Figure 2. Arteriogram at the level of subclavian artery. Compression of the SCA by tumor is evident.

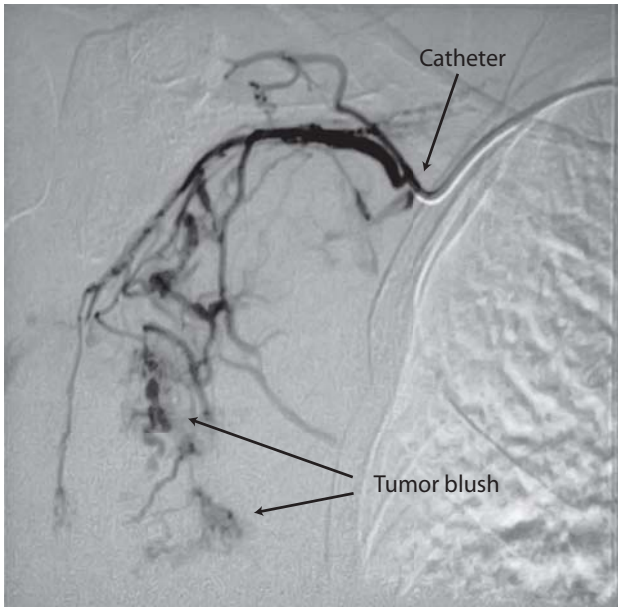

Figure 3. Superselective arteriogram in a branch of SCA feeding the tumor. Embolization with gel foam until near stasis of contrasted medium.

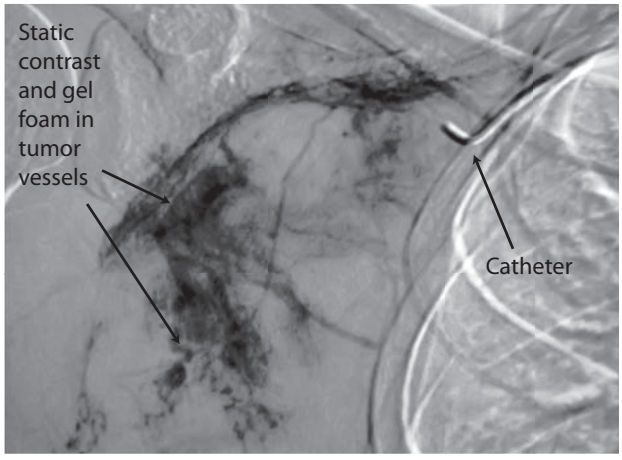

Figure 4. Embolization with chemotherapeutic drugs towards the end of the procedure; stasis of arterial flow in tumor.

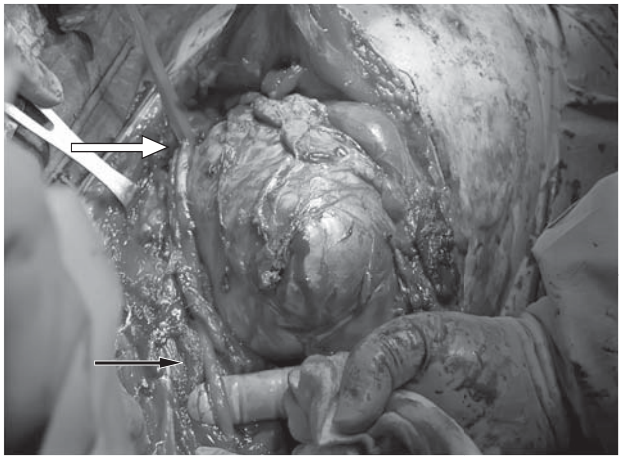

Figure 5. White arrow shows subclavian artery, black arrow shows brachial plexus.

marginally in the brachial plexus area. More specifically, a "T"-shaped incision was performed; the radial nerve was abutted by the tumor and was freed marginally (Figure 5) while the subclavian vein had to be ligated due to its intratumoral course. The biopsy proved the lesion to be a high-grade (III according to Coindre/FNCLCC) fibrosarcoma with neoplasmatic emboli in the subclavian vein, focally positive margins and tumor necrosis up to 50% (partial response). Consequently the patient underwent 3 cycles of chemotherapy with the MAID regimen (ifosfamide/mesna, adriamycin, dacarbazine) and high dose RT (total dose 6500 cGy). No significant side effects were encountered.

The patient is free of disease at the latest follow-up (36 months); the cosmetic result, neurological recovery and functional rehabilitation is excellent and the patient returned to his previous occupational and sport activities.

Discussion

Various investigators have proposed chemoembolization as a means of effective complementary therapy in bone and soft tissue tumors [4,6-10]. Most use it in metastatic diseases [8-11] while others in advanced bone malignancies [11] or soft tissue sarcomas [4,5].

Historically, the first who introduced the concept of chemoembolization was Kato [9] who used ethyl cellulose microencapsulated mitomycin C spheres (225 μm). The technique consists of combination of intra-arterial chemotherapy and embolization after catheterization of the tumor feeding artery (the closer we get to the tumor the better results and the fewer side effects we have due to less collateral circulation [12]). The embolization creates tumor ischemia which stops tumor growth and induces regression [13]. The emboli slow the transit time through the tumor vascular bed, the drug clearance is diminished and the time of drug-tumor interaction increases [7,9]. This also means that the local drug concentration increases and, considering the steep dose-response curve of most chemotherapeutic agents [4,7], the drug effect is maximized. The intraarterial route also increases the drug concentration 5 to 9 times compared with the intravenous route [7]. However, the systemic concentration and consequently the toxicity will be the same or less [7,14]. Maybe this is due to the metabolism of the drug on its first passage through the infused tumor cells [15].

Local complications that have been encountered include vasculitis, arterial thrombosis from intraarterial adriamycin, skin necrosis, desquamation, erythema. Steroids have been employed in order to alleviate these symptoms [7]. We formally use intravenous Solu Medrol 500 mg during the procedure.

The size and type of particles being used will determine the site of vascular interruption; materials such as gelfoam powder (40-60 μm), gelfoam cubes (1-3 μm) and ivalon polyvinyl alcohol foam particles (150-500 μm) are most often used for peripheral embolization. Stainless steel coils and gel foam segments are used for central occlusion. The extent of the occlusion depends on the materials used and the speed of solidification. Overall, the mechanism of action, the concentration of the particles and the method of delivery will determine the success of the occlusion [6,7,16].

We tend to use the VAC regimen for chemoembolization since our team is familiar with its administration and generally it has been widely used in Ewing sarcomas [17], in rhabdomyosarcomas, in uterine sar-

comas and also in soft tissue sarcomas (± actinomycin, dacarbazine) [18-20]. Especially for fibrosarcomas, there is a study from the Italian Group [21] in young and older children utilizing VAC neoadjuvant chemotherapy. Because of the partial tumor response to VAC (50% necrosis) our oncology team decided to "tailor" [22] the adjuvant treatment with the MAID regimen, widely used in soft tissue sarcomas [23,24]. Most authors agree that adjuvant chemotherapy is beneficial in stage III soft tissue sarcomas and should be used routinely [1,25], while others support its selective use due to treatment morbidity or long term results [26,27].

Overall, in cases of stage III soft tissue sarcomas adjacent to major neurovascular bundles – as in our patient - a multidisciplinary approach is well-advised. Chemoembolization is an effective therapy aiming at downstaging the tumor by decreasing its size and forming a surrounding rim, leading to better chances of limb-sparing resection and also allowing to "tailoring" the postoperative chemotherapy. Adjuvant chemotherapy and RT are also of great importance, especially in cases with marginal resection.

Acknowledgements

We thank Ms Christina Panou for text editing.

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