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Place of modern imaging modalities for solitary plasmacytoma: Toward improved primary staging and treatment monitoring

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Abstract

Radiation therapy (RT) is the mainstay of treatment of solitary plasmacytoma. In most cases, doses ranging from 40 to 50 Gy yield in a local control more than 80%. However, the prognosis of patients with SP is marked by a high rate of transformation to multiple myeloma (MM), and there is no demonstrated benefit of adjuvant chemotherapy for decreasing this probability. However, clinical benefits could be reached from improving screening for other primary sites of plasmacytoma and earlier discovering signs suggestive of MM. Since such strategy could provide significant information regarding both prognosis and therapy, it has become first importance to improve initial staging of tumor widespread. Although conventional skeletal X-ray survey remains standard, usual sensitivity of radiographies does not

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permit diagnosing early myeloma lesions and a significant number of patients with supposed SP might be understaged and do not receive the appropriate treatment. The development of more sensitive and specific imaging modalities will make it feasible to earlier detect subclinical lesions, thus leading lead to new approaches in the treatment strategies. Here, we discuss the benefits and limitations of magnetic resonance imaging and positron emission tomography for primary staging of patients with solitary plasmacytoma. Both imaging modalities could also improve target volume delineation and assessment of tumor response after RT.

Keywords: Plasmacytoma; Myeloma; Radiation therapy; Magnetic resonance imaging; Positron emission tomography

1. Introduction

Solitary plasmacytoma (SP) is a solitary tumor resulting of an uncontrolled proliferation of monoclonal plasma cells. Contrary to multiple myeloma (MM), it is characterized by the lack of evidence of significant bone-marrow plasma-cell infiltration [1–3]. This rare tumor accounts for no more than 2% of all cases of MM, which incidence has been estimated to 3.5 *per* 100.000 people annually. Most patients with SP are more than 60 years old, with a male to female ratio of 3:1. At first presentation, SP could be classified into two subgroups, depending on their location. Extramedullary plasmacytoma (EMP) are soft tissue lesions developing within soft tissue, essentially in the head and neck area. Solitary bone plasmacytoma (SBP) are more frequent (70% of all SP) and occur primarily in marrow-containing bones, such as vertebrae, femurs, pelvis and ribs [1–8]. Whatever their origin, the prognosis of SP is characterized by a high probability of transformation into MM within 10 years after diagnosis, in about 50% of patients with SBP and 30% of patients with EMP. Ten years overall survival (OS) of patients with SP ranges from 50 to 70%, depending on both patients' associated morbidities and the probability of transformation into MM. Due to relative sensitivity to ionizing radiation, definitive radiation therapy (RT) is frequently reported as being the treatment of choice for patients with SP, giving adequate control. However, it has become a clinically relevant issue to improve the initial radiological evaluation of SP, since the discovery of signs suggestive of MM but also early detection of additional or recurrent lesions of SP will change drastically both prognosis and treatment modalities. Another difficulty is the evaluation of the treatment response after local therapy. Most recent imaging modalities could improve accuracy of initial staging and provide meaningful prognostic information [9].

In this paper, the literature is reviewed and some specific features of SP are discussed about the use of MRI and 18F-FDG PET/CT and their impact in terms of therapeutic strategy and for evaluation of treatment response after RT.

2. Current strategies and their limitations

2.1. Conventional primary staging

While any part of the entire skeleton can be concerned with SBP, the vertebral body and peduncles are the sites where the osteo-plasmacytoma has a higher hematopoietic proliferation. At first presentation, SBP usually presents as a unique vertebral collapse. Consequently, it is important to screen any part of the skeletal to ensure that there is no other lesion at time of diagnosis. Conventional radiographies of the skeleton are therefore recommended for assessing the cranium, vertebrae, pelvis, thorax, ribs, upper limbs and proximal femur. Rodallec et al. reviewed the radiographic characteristics of various solitary tumors of the spine, including SP [10]. As the authors highlighted, SBP is associated with replacement of the normal medullar bone, while the cortical bone is partly preserved or sclerotic. These aspects of cortical thickening are rather specific, resulting in an aspect of hollow vertebral body or pedicle, which may be associated with a spontaneous bone-fracture [11]. In two-thirds of the cases, the lesion appears to be mixed with predominantly osteolytic characteristics. More rarely, the lesion is multicystic. Usual sensitivity of radiographies does not permit diagnosing early MM lesions, since those are apparent only when trabecular bone loss ranges from 30 to 50%, making CT an important tool in the diagnosis of SBP. A lytic vertebral lesion with cortical thickening is highly suggestive of SBP, which gives to the vertebra the appearance of "minibrain" on axial images. There may be neoplastic tissue producing mass effect and compression within the medullary cord or the epidural space and exhibiting contrast enhancement. More rarely, the tumor involves the intervertebral disc and/or the adjacent vertebrae [10–12]. Other sites than the spine can be concerned, such as the pelvis, the mandible, the mastoid, the vault or skull base, particularly the clivus or petrous apex. EMP usually occurs in the head and neck area (80%). In this situation, most frequently concerned sites are the nasopharynx or the paranasal sinuses [13–15]. More rarely, EMP can be observed in any part of the head and neck anatomy, such as salivar glands, aerodigestive superior tract, cervical lymph nodes, middle ear, scalp, tongue and others. Finally, the differential diagnosis with SBP can be sometimes difficult when solitary EMP develops from the submucosa of sino-nasal structures and involves subjacent bone structures toward the skull base [16].

2.2. Radiation therapy: the mainstay of treatment

Numerous papers have discussed the place of RT for treatment of SP or EMP. For both, surgery is rarely required, excepted when epiduritis or spinal cord compression make laminectomy necessary. In other situations, RT alone is usu-