Total spondylectomy for solitary bone plasmacytoma of the lumbar spine in a young woman: a case report and review of literature

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Abstract

Introduction Solitary bone plasmacytoma (SP) is a rare diagnosis for which the primary treatment is local radiotherapy. There is no established consensus suggesting a total spondylectomy in spinal SP.

Materials and Methods We report the case of a 43-year-old woman with solitary plasmacytoma of the lumbar spine treated with complete vertebral resection. Radiographs, CT scan and MRI showed a single osteolytic lesion of the third lumbar vertebra. Further diagnostics following recommended algorithm for tumour screening were negative.

Two times, biopsy showed no histological pathologies. Due to the instability of the spine with suspicious unknown lesion, we decided to perform a dorsal lumbar approach and instrumentation with complete resection of the posterior parts to prepare for a complete resection if mandatory. Resamples were taken and the bone surfaces sealed. Consecutive findings were positive for plasma cell infiltration of the respective vertebra, however not on the first pass, but after diagnostic pathological reference. Surgery was completed by total spondylectomy. Reference histological findings with restaging and cytogenetic risk analysis confirmed a non-high-risk solitary bone plasmacytoma, and the patient was scheduled for localized radiotherapy with 40 Gy.

Results Follow-up examinations (53 months) showed no local recurrence or disease progression.

Discussion There is no consensus in the literature regarding appropriate surgical approach and perioperative strategies in the treatment of solitary plasmacytoma. The finding of a solitary plasmacytoma of the spine was the determining factor for our decision to perform radical surgery with subsequent radiotherapy. The rationale for the chosen approach was to minimize the risk of local recurrence and to avoid conversion into multiple myeloma. The follow-up with 53 months is limited. However, discussion remains, if radical surgery in addition to local radiotherapy could be an alternative therapeutic approach depending on paraclinical parameters, age and cytogenetic risk analysis.

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Case report

We report a case of a 43-year-old woman with a 1-year history of low back pain. Conventional X-rays (Fig. 1) and CT scan

Fig. 1 Conventional preoperative anterior–posterior (ap) and lateral X-rays demonstrating a lesion of the third lumbar vertebra

Fig. 2 CT scan of the lumbar spine: different views of the affected third lumbar vertebra

(Fig. 2) showed a single osteolytic lesion of the third lumbar vertebra. Advanced laboratory results including special parameters of multiple myeloma were without pathological findings. Further imaging diagnostics with bone scintigraphy, CT scans of thoracic and abdominal region and whole-spine MRI (Fig. 3) following recommended tumour screening guidelines showed no specific hint. The case was discussed twice in the interdisciplinary tumour board. Expecting a

Fig. 3 Whole-spine MRI demonstrating a single lesion of the osteolytic third lumbar vertebra

primary pathology such as giant-cell tumour or a solitary plasmacytoma, a biopsy was recommended. Two successive punctures of the suspect lesion via a transpedicular approach and a bone marrow biopsy showed no histological pathologies in spite of an adequate amount of material.

Due to instability of the vertebra caused by a suspicious unknown lesion, we chose to perform an initial posterior stabilization and a complete resection of the posterior parts to prepare for staged complete spondylectomy, if mandatory. Thus, we implanted a screw-and-rod construct from L1 to L3 with cross connectors (Expedium® Spine system, DePuy-Spine, Germany) (Fig. 4). Then we removed the posterior lamina en bloc with the pedicles after flavum resection, removal of the inferior facets of the facet joints and cutting the pedicels with a Gigli saw near the posterior wall. New biopsy samples were acquired through a transpedicular approach and the surfaces of the pedicles were sealed with bone wax to minimize contamination by tumour cells (Fig. 5).

Consecutive histological findings were positive for atypical plasma cell infiltration of the respective vertebra, however not on the first pass, but after diagnostic pathological reference (Fig. 6a, b). Thus, a solitary plasmacytoma could be confirmed.

Fig. 4 Conventional X-rays after resection of the dorsal vertebral structures and before histopathological confirmation of a solitary plasmacytoma in AP and lateral view

Fig. 5 Posterior view in situ after resection of the dorsal vertebral structures

We completed the surgical treatment by performing a spondylectomy through an anterior left-side lumbotomy. We removed the adjacent discs performing a complete transection through the disc spaces without compromising the third and fifth lumbar vertebra. After blunt mobilization, the whole vertebra was removed (Fig. 7). Vertebral body replacement was performed using an expandable cage (Obelisc, Ulrich medical, Germany). An anterior rod was placed to achieve additional stabilization of the construct

(Expedium[®] Spine system, DePuy-Spine, Germany). To allow for fusion, cancellous bone from the iliac crest mixed with allograft cancellous bone was added. The histopathological workup of the specimen achieved clear margins. Haematology with restaging and cytogenetic risk analysis with interphase fluorescent in situ hybridization (FISH) confirmed a non-high-risk solitary plasmacytoma (Type IgG lambda).

Furthermore, the case was discussed in the tumour board again. Considering the age and with the rationale of improving the prognosis regarding local recurrence and progression into multiple myeloma, postoperative local radiotherapy was recommended. The patient was then scheduled for postoperative local radiotherapy with 40 Gy.

Results

Wound healing was without problems and the postoperative course was unremarkable. The follow-up examinations (every 12 month) over the last 4 years with laboratory and imaging diagnostics showed no pathologic recurrence or progression into multiple myeloma (Fig. 8). CT scan of the operated region showed bony fusion after 2 years (Fig. 9). In the follow-up the patient is controlled regularly by the haematologist as well. The patient is pain free without limitations in her daily activities.

Review of the condition and evidence-based literature

In patients with plasma cell dysplasia, an estimated 5 % present with solitary plasmacytoma of the bone (SP) or extramedullary plasmacytoma [1]. Both types are separate entities, but their origins resemble that of multiple myeloma (MM) in terms of proliferation of monoclonal plasma cells [2]. A reliable diagnosis implies precise criteria to be confirmed as such [3]. The median age at diagnosis of SP is, on average, 10 years younger compared to patients with MM. To date, the primary treatment for SP is local radiotherapy. Furthermore, radical surgery with a curative intent seems to be not indicated based on the high radio-sensitivity of the tumours with a local control rate reported to range within 80–100 % [4]. Surgery is recommended in cases of instability or neurologic impairment [5, 6]. In contrast, progression into multiple myeloma has been reported to occur in 50–60 % of patients with SP, after initial radiation therapy [7–9].

In review of the recent literature, there are different recommendations regarding the treatment strategies in case of solitary plasmacytoma of the bone. The main problem remains the unpredictable progression of the disease into multiple myeloma. Several clinical series have reported a high rate of progression. In addition, the median time to

Fig. 6 **a** Specimen with $\times 400$ magnification and immunohistochemical staining against the CD138 antigen (specific for plasma cells). Distinctive infiltration by atypical plasma cells. **b** Specimen with $\times 400$ magnification and immunohistochemical staining against the antigen immunoglobulin light chain lambda. Distinctive infiltration by atypical plasma cells

Fig. 7 L3 vertebra after spondylectomy

Fig. 9 CT scan 4 years postoperatively

Fig. 8 Postoperative conventional X-ray at follow-up of 4 years in AP and lateral view

progression was demonstrated to range between 2 and 4 years, particularly in the spine [7–9]. The median overall survival time varied from 7.5 to 12 years after radiation therapy alone [5, 10]. The overall survival in solitary

plasmacytoma of the bone is significantly lower compared to the extramedullary type. Moreover, the disease has been demonstrated to progress into multiple myeloma more frequently. Vertebral affection has been reported to be a poor prognostic factor compared with other skeletal localizations [4]. Some studies have suggested that the benefits of radiation therapy in patients with young age and less tumour mass were a positive outcome and increased overall survival [11]. On the contrary, there is evidence of an increased failure rate in patients with spinal lesions receiving monotherapeutic local radiotherapy [12, 13]. Several series have shown high rates of local stagnancy, but the overall survival is disappointing due to the likelihood of SP to progress into multiple myeloma [14, 15].

To date, the recommended treatment of SP is local radiation therapy without surgery. Yet, randomized studies

confirming its superiority over surgery alone or in combination do not exist. Moreover, surgical interventions prove to be supportive in SP mostly in cases involving neurologic impairment or spinal instability [5]. Huang et al. [20] recommend surgery (piecemeal manner) with adjuvant radiotherapy for solitary plasmacytoma of the cervical spine in patients with neurological lesions and spinal instability.

Rationale for chosen treatment

In this case, surgery was necessary due to the instability. Expecting a primary pathology, we decided on a surgical procedure which allowed for staged total spondylectomy. The rationale for the chosen treatment of total spondylectomy and radiotherapy was to minimize the risk of local recurrence and to avoid conversion into multiple myeloma.

In conclusion, the mid- and long-term outcome of spondylectomy and postoperative local radiation therapy in solitary plasmacytoma of the spine must be evaluated [16, 17]. Discussion remains if radical surgery combined with postoperative radiotherapy could be an option to avoid or reduce progression into multiple myeloma [18, 19].

Conflict of interest None of the authors has any potential conflict of interest.

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