Chordoma: Excellent Response to Radiotherapy in Combination With Hyperthermia

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Abstract- Chordoma is a bone tumor that is resistant to radiotherapy, and few studies have been published on the concomitant use of radiotherapy in combination with hyperthermia in its treatment. We reported a chordoma patient treated with both radiotherapy and hyperthermia. The patient was a 74-year-old man with chordoma who underwent radiotherapy combined with hyperthermia due to his unwillingness to undergo surgery and responded very well clinically and imaging-wise without increasing in complications. Radiotherapy combined with hyperthermia improves the response to treatment (both clinically and in imaging) and does not increase the complications.

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Introduction

Chordoma is a rare bone tumor. Based on a recent systematic review, the incidence rate of this tumor is 0.18 to 0.84 per 1,000,000 per year (1). The primary occurrence site for this tumor is sacral region (2). Male gender involvement is more than female (2). Recurrence of the tumor is local but distant metastasis occasionally occurs specially in later stages of disease (3,4). Main treatment approach for this tumor is known as surgery. Because surgery and complete resection is not possible in most cases, adjuvant radiotherapy is often indicated (4). Radiotherapy alone is also applied for unresectable tumors. Multiple studies demonstrated that radiotherapy improves local control and disease-free survival (5). In addition to radiotherapy alone, hyperthermia in combination with other modalities such as chemotherapy, radiotherapy, proton showed promising results over response rate (6,7,8).

In this report, we presented a case of sacral chordoma that was treated with radiotherapy in combination with hyperthermia.

Case Report

The patient is a 74-year-old man that presented with pelvic pain since 1 year ago. He was a retired fireman. In his past medical history, he had stomach cancer about 8 years ago and had undergone preoperative chemotherapy (with DCF regimen) and surgery. It was currently asymptomatic and had no local recurrence or metastasis on examination. He has also a history of high blood pressure and has been controlled with antihypertensive drugs. On physical examination, there

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were no positive findings other than sacral and coccygeal tenderness. After primary laboratory tests, MRI was done. MRI showed two large masses connected to each other in sacral region that enhanced with gadolinium injection.

One mass was on the posterior arc of the sacral spine and iliac bone on the left side measures approximately 10.7 cm in its greatest diameter. The mass had extended into the sacral vertebral canal. Another mass was in the coccyx and distal of sacrum on the right side which measures approximately 7.3 cm diameter. The tumor had pressure mass effect on the sciatic nerve. Biopsy was done from the mass, and it was pathologically proven case of chordoma. The patient was a candidate for surgery and resection and therefore he was hospitalized. However, he refused surgery and consequently his physician initiated systemic treatment with Imatinib. After few months, the patient's symptoms improved partially. But he did not tolerate taking this drug more. With progression of pain, getting up and sitting down of the patient were difficult. He had to eat in upright position and his functional ability and daily activities gradually decreased. Therefore, the patient was re-evaluated, and MRI was performed again. In the repeated MRI, the dimensions of the tumor were unchanged. The patient was referred for radiotherapy and we treated him with a combination of radiotherapy and hyperthermia.

Radiotherapy

After CT scan simulation (Siemens 64 slices) with slice thickness of 3 millimeters, three-dimensional conformal radiotherapy planning was done with TIGRT software (ver. 1.0.8545, Linatech, LLC. www.LinaTech.com). Initially, gross tumor volume (GTV) was contoured. Then CTV and PTV were contoured with added 0.5 cm and 1.0 cm margins to GTV, respectively. After contouring the targets and organs at risk, six radiation fields (Antero-Posterior, Postero-Anterior, Right Anterior Oblique, Right Posterior Oblique, Left Anterior Oblique, Left Posterior Oblique) were defined with 15 MV photon beams for treatment with a linear accelerator machine (Primus, Siemens company). Small bowels, bone and soft tissues, and other parts located out of targets were blocked with an external MLC. Whole treatment course was done in only 1 phase for a total dose of 7000 cGy (in 35 fractions) to cover the PTV with 95% isodose curve.

Hyperthermia

Local hyperthermia was applied (Celsius42+system, GmbH, Deutschland) two times per week to the pelvic region before daily radiation therapy. Overall, 14 sessions hyperthermia were applied locally with two 25 cm electrodes over the affected region. The system was calibrated prior to hyperthermia treatment according to European Society of Hyperthermia in Oncology (ESHO) guideline for regional hyperthermia and treatment protocol was also based on Dr Huseyin Sahinbas introduced method (Practice Clinic Hperthermie and Support Care, Institute for Hyperthermia Research at Marien Hospital Herne, Ruhr University Bochum Clinic).

Discussion

In general, Chordoma is a radioresistant tumor and therefore requires high radiation dose to be treated with radiotherapy (9). The disadvantage of this feature is high radiation dose to the surrounding normal tissues which may not tolerate the treatment. One of the methods to make this tumor more sensitive to radiation and potentially better response to treatment is simultaneous hyperthermia accordance with radiotherapy (10-12). Although the effectiveness of radiotherapy in improving local control and disease-free survival has been demonstrated in various studies, new efforts have focused on the use of more advanced methods such as protons, neutrons, heavy ions, and carbon ions (5,13-16). The effect of using hyperthermia in combination with the above new methods is also being investigated. Like most of the inventory reports and studies that have been published so far, the use of hyperthermia with radiotherapy to treat this case was satisfactory. During radiotherapy treatment, the patient is visited by the treating physician once a week on average. At each visit, the patient was evaluated for the symptoms of the tumor, including pain, difficulty for sitting down and getting up, as well as the possible side effects of combination therapy, and tolerance to treatment. The patient's symptoms gradually improved and the patient's pain completely disappeared, and the patient could sit down and get up easily without any problems. In the last two weeks of treatment, the patient developed brief diarrhea (grade 2) that was controlled with Loperamide and had no problems at the end of treatment. After 35 sessions of radiotherapy, the patient underwent another CT scan and the tumor volume after treatment was compared with before treatment (Figure 1). Tumor volume decreased from 500 cc before treatment to 300 cc on the last day of treatment. In addition, it is potentially expected that over time, the response will be greater as the tumor size

decreases in subsequent images.

Our treatment in this patient showed that the combination of radiotherapy with hyperthermia improves the response (clinically and in imaging) and does not increase the complications. However, more clinical studies are needed to demonstrate the effect of hyperthermia in combination with radiotherapy on improving the outcomes of local control and survival.

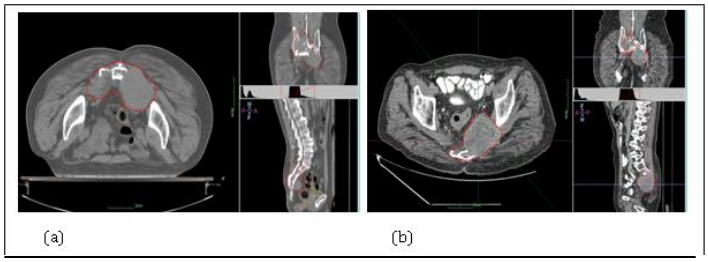

Figure 1. GTV contour in red color: a) before treatment in prone position, b) after radiotherapy combined with hyperthermia in supine position

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