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The efficacy of ^{89}Sr combined with ^{99}Tc-MDP in the treatment of the advanced breast cancers with bone metastases

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Abstract *Objective:* The aim of our study was to evaluate the efficacy of ^{89}Sr combined with Technetium [^{99}Tc] Methylene-diphosphonate Injection (^{99}Tc-MDP) in the treatment of cancer pain in the advanced breast cancers with bone metastases. *Methods:* A total of 80 patients with various degrees of bone pain due to multiple metastases of breast cancer were treated with ^{89}Sr combined with ^{99}Tc-MDP. ^{89}Sr was given intravenously at 4mCi on day 1 during the 3-month schedule. After 7 days, ^{99}Tc-MDP was given at 22 mg/day on days 1–10 during the 1-month schedule, for 3 to 6 months. *Results:* The effective rate of relieving pain was 83.75%. The effective rate of curing bone metastases was 81.25%. So there was a significant improvement in the quality of life of the patients. *Conclusion:* ^{89}Sr combined with ^{99}Tc-MDP are effective in the treatment of cancer pain in the breast cancers with bone metastasis, and can obviously repair the bone destruction caused by metastases, thereby improving the quality of life in advanced breast cancer patients with bone metastases.

Key words breast cancer; bone metastases; ^{99}Tc-MDP; ^{89}Sr

Breast cancer is the one of the most common malignancies among female. In recent years, the incidence of breast cancer has increased year by year. And there is a trend of younger age of onset [1]. The patients with advanced breast cancer are prone to bone metastases, then pain, swelling, fractures and other adverse events appeare. These events seriously affect the quality of life of the advanced breast cancer patients. From October 2008 to October 2013, 80 patients with multiple bone metastases of breast cancer were treated with ^{89}Sr combined with ^{99}Tc-MDP.

Materials and methods

Clinical data

The group of 80 cases of metastatic breast cancer patients were all females, aged from 35 to 72 years, with an average age of (56.7 ± 8.6). All patients had pathologic diagnosis of primary tumor, by imaging [bone scintigraphy, X ray, CT or (and) MRI] confirmed systemic multiple bone metastases. There were more than 3 places of bone metastases with them.

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Treatment

Everyone was treated with ^{89}Sr combined with ^{99}Tc-MDP. ^{89}Sr was given intravenously at 4mCi on day 1 during the 3-month schedule; and 7 days after, ^{99}Tc-MDP was given at 22 mg/day on days 1–10 during the 1-month schedule, for 3 to 6 months. Testing the blood, liver function, kidney function and electrolytes 1–2 weeks before and after treatment, and testing the bone scintigraphy 3–6 months later.

Pain and treatment evaluation

According to the chief complaint of pain fractionation (verbal rating scale, VRS [2]). The pain was graded as follows: grade 0, painless; grade I, mild pain, it can be tolerated, and not affect sleep, you can live a normal life; grade II, moderate pain, pain was evident, with sleep interference, it required general analgesic, sedative, hypnotics drugs; grade III, severe pain, pain was severe, accompanied by autonomic dysfunction, sleep was seriously disturbed, it needed opioids drugs. Table 1 was the classification of pain in this group. Analgesic effect was divided into: completely effective (CR): pain relieved 2 degrees or above or disappeared; partial response (PR): degree of pain relieved 1; invalid (NR): the pain did not relieved or aggravated. CR and PR treatment were both effective.

Elimination of bone metastases was evaluated based

Table 1 The pain rating and therapy of 80 cases of breast cancers with bone metastases

Treatment effect	Pain rating		
	Grade I	Grade II	Grade III
CR	13	11	5
PR	0	16	22
NR	0	5	8

imaging as a criterion: grade I markedly, all metastases disappeared confirmed by bone scintigraphy; grade II, bone scintigraphy demonstrated the size or number of metastases reduced > 50%; grade III improvement, the size or number of metastases decreased > 25% in bone scintigraphy examination; grade IV invalid, bone scintigraphy demonstrated that the size or number of metastases reduced < 25% or no changed.

The main side effects were myelosuppression and gastrointestinal reactions.

Results

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A total of 80 cases of breast cancers with bone metastases, CR in 29 cases, PR in 38 cases, and NR in 13 cases, the total efficiency was 83.75%. As for the elimination of bone lesions: 8 cases reached grade I, 26 cases grade II, 31 cases grade III and 15 cases grade IV, the effective rate was 81.25%.

Adverse reactions

Only a few patients had a slight decrease in platelets and white blood cells in our observation, and it could restore itself 8–12 weeks later. Both liver and kidney function and electrolytes did not change significantly before and after treatment.

Discussion

Due to mulitiple radiotherapy and chemotherapy, the patients with advanced breast cancer are in weak constitutions. Most of them can not tolerate further chemotherapy. And the chemotherapy drugs have poor analgesic effect. Bisphosphonate is better in analgesic effect, but there are some adverse effects in liver and kidney function to elderly patients. Painkillers is the most widly used in the treatment of pain of cancers with multiple bone metastasis, but there are significant side effects and addiction, which limite the dose and affect the therapeutic effect. Otherwise the ^{89}Sr therapy is effective in relieving pain of late-staged cancers metastatic patients [2].

External beam radiation therapy has a good effect for localized disease. However a wide range of radiation is not suitable for multiple lesions, repeat radiotherapy for local recurrence of lesions lead to bigger side effects. ^{89}Sr can inhibition of tumor cells generated or kill tumor cells mainly through radiation damage. ^{99}Tc-MDP can inhibit osteoclast's activity, and prevent the dissolution of hydroxyapatite crystals. It can also inhibit and repair bone destruction induced by tumor, prevent pathological fractures, maintain balancea of the bone metabolism. And the study found that ^{99}Tc-MDP can inhibit prostaglandin synthesis, having a good analgesic effect on bone metastases [3]. Recent studies have demonstrated that the combination of ^{99}Tc-MDP with radionuclide in the treatment of bone metastases can reduce blood toxicity induced by radionuclide therapy [4].

Eighty breast cancers with multiple metastases are treated with ^{89}Sr combined with ^{99}Tc-MDP. CR is 29 cases, PR 38 cases, and NR 13 cases, the total efficiency is 83.75%, those are similar to that reported in literature [5–7]. Bone lesions elimination: 8 cases reach grade I, 26 cases grade II, 31 cases grade III and 15 cases grade IV, so the effective rate is 81.25%.

The new bone lesions emerge in patients during treatment. In line with Liu Feng's report, ^{89}Sr cannot prevent new bone metastases. Taking clinical information into account, it maybe relevant with tumor progression. The 13 cases of pain-free remission, considered insensitive to radiation, it may be related with significant pathological fractures and osteolytic lesions of bone destruction.

The effect of combination therapy of ^{89}Sr and ^{99}Tc-MDP on bone marrow suppression is not obvious, and also of liver and kidney function.

The combination of ^{89}Sr and ^{99}Tc-MDP in the treatment of bone metastasis in breast cancer is safe, exact analgesic efficacy, simple, and low toxicity. It is worthy of clinical application and promotion.

Conflicts of interest

The authors indicated no potential conflicts of interest.

References

1. Collaborating study group on breast cancer bone metastasis. Expert consensus on the diagnosis and treatment of bone metastasis and skeletal related events in breast cancer patients. Chin J Oncol (Chinese), 2009, 31: 156–159.
2. Wang JQ, Cao CX, Yin H, *et al*. Efficacies of ^{89}sr and combination treatments with regional extra-beam radiotherapy for cancer patients with multiple bone metastasis. Chinese-German J Clin Oncol, 2010, 9: 536–538.
3. Yu RB, Sun ZX, Wang QM, *et al*. Value of ^{99}Tc-MDP combining with ^{89}Sr in therapy of osseous metastasis in patients with tumor. Cancer Res Prev Treat (Chinese), 2001, 38: 455–457.
4. National Continuing Medical Education Programs. Radionuclide therapy workshops (MDP clinical applications) materials. Beijing: Chi-

nese Medical Electronic Audio and Video Publishing House, 2002. 132–137.
5. Li JF, Zou DH, Zhu XS, *et al.* The evaluation of pain palliation efficacy of ^{89}Sr and ^{153}Sm-EDTMP treating multiple bone metastasis of prostate, breast, lung and gastrointestinal cancers. Guangzhou Med J (Chinese), 2006, 37: 12–14.
6. Liu ZJ, Yang XR, Chen YS, *et al*. Efficacy from ostalgia of metastic bone tumour treated with strontium dichloride. Chin Pharm (Chinese), 2005, 8: 408–409.
7. Liu KL, MO Y. The efficacy of ^{89}Srcl in treatment of the bone metastases cancer patients of prostagland carcinoma, breast carcinoma, lung carcinoma. J Mod Oncol (Chinese), 2006, 14: 475–476.

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