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*Original Article*

# Analysis on safety and value of CT-guided percutaneous chemical ablation in treatment of pelvic hypovascular metastasis

Yan-Xia Xu[1*], Ming-Jie Zhang[2], Hong-Min Zhou[3*]

*[1]Department of Imaging, Jining First People's Hospital of Shandong, 272000, Shandong, China; [2]Department of Imaging, Jinxiang People's Hospital of Shandong, 272200, Shandong, China; [3]Department of Imaging, Jining Cancer Hospital, 272000, Shandong, China. [*]Co-first authors.*

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**Abstract:** Objective: To investigate the clinical efficacy of CT-guided percutaneous chemical ablation in treatment of pelvic hypovascular metastasis. Methods: Based on a retrospective analysis of the clinical data of 78 patients with pelvic hypovascular metastasis, CT-guided percutaneous chemical ablation was used to directly puncture lesions. The emulsion consisting of ultra-liquid iodized oil, anhydrous ethanol and oxaliplatin in the proportion of 1:2:2 was slowly injected to the lesions, which should be filled to the greatest extent. The postoperative follow-up lasted for 2~51 months. Results: After surgery, 23 of these 78 cases were reported with merely residual fibrous cords or calcified shadow or complete recovery, and the lesion volume was reduced by ≥ 50% in 55 cases compared to that before surgery, indicating a total effective rate of 100% (78/78). The tumor size after treatment was significantly reduced compared to that before treatment [(4.5 ± 1.9) $cm^2$ vs (20.6 ± 10.1) $cm^2$], and the difference was statistically significant ($P$ = 0.018). Of 34 patients suffering from pain in perineum, buttocks and/or legs and limited mobility of the lower extremities, eliminated pain were reported in 13 cases and relieved symptoms in 21 cases. No intraoperative and postoperative complications were observed. Conclusion: In treatment of pelvic hypovascular metastasis, CT-guided percutaneous chemical ablation proves to be minimally invasive, effective and worthy of clinical promotion.

**Keywords:** Abdominal cavity, pelvic tumor, metastasis, catheter ablation, CT guidance

## Introduction

CT-mediated minimally invasive treatment is a technique that performs puncture and treatment of lesions under CT guidance and monitoring. It has been widely used in clinical practice owing to its characteristics of simple operation, less pain for patients, high security, less blood loss and quick postoperative recovery; the main treatment methods include chemical ablation, intratumoral injection of chemotherapeutic drugs, microwave coagulation, particle implantation, radiofrequency ablation, etc [1, 2]. In our hospital, the treatment of pelvic hypovascular metastasis using CT-guided percutaneous chemical ablation has achieved significant effect and the details are reported as below.

## Materials and methods

### *General information*

Seventy-eight cases of patients with pelvic hypovascular metastasis admitted to our hospital from February 2009 to February 2014, including 31 males and 47 females aged from 38 to 67 (51.2 ± 8.5) years, underwent CT-guided percutaneous chemical ablation; all of them were patients with abdominal or pelvic metastasis occurring within 1 to 3 years after malignant tumor surgery, including 50 cases of pelvic metastases after ovarian cancer surgery, 18 cases of pelvic metastases after colon cancer surgery and 10 cases of pelvic metastases after colonic mucinous carcinomas surgery. The preoperative examination items for patients included blood routine, blood biochemistry,

liver and kidney function, coagulation function, tumor markers, ECG, ultrasound and CT. Imageological examination: Those featured with solid lesions were 39 cases, those featured with cystic lesions were 23 cases and those featured with cystic-solid lesions were 16 cases. Tumors ranged from 1.9 cm × 2.6 cm to 5.5 cm × 6.3 cm with an average of (20.6 ± 10.1) $cm^2$; 48 cases of patients suffered from pain in perineum, buttocks and/or legs and limited mobility of the lower extremities. Increased carcinoembryonic antigen (CEA) was reported in 40 cases, and increased cancer antigen 125 (CAI25) in 38 cases. This study was conducted in accordance with the declaration of Helsinki. This study was conducted with approval from the Ethics Committee of Ji Ning Cancer hospital Written informed consent was obtained from all participants.

Imageological examination found 12 cases of intra-abdominal omental bursa metastases and 12 cases of abdominal wall metastases, as well as 54 cases of pelvic metastases, including 21 cases of pelvic wall metastases, 17 cases of vesicorectal pouch metastases and 16 cases of rectococcygeal space metastases. Those featured with solid lesions were 39 cases, those featured with cystic lesions were 23 cases and those featured with cystic-solid lesions were 16 cases. Tumors ranged from 1.9 cm × 2.6 cm to 5.5 cm × 6.3 cm with an average of (20.6 ± 10.1) $cm^2$; 34 cases of 54 patients with pelvic metastasis suffered from pain in perineum, buttocks and/or legs and limited mobility of the lower extremities. Increased carcinoembryonic antigen (CEA) was reported in 40 cases, and increased cancer antigen 125 (CAI25) in 38 cases.

*Therapeutic methods*

According to the location of lesions, the patients were placed in the prone position or the lateral position. The lesions were scanned by CT to observe their location and the relationship with the surrounding tissues and organs. The puncture point was designed in such way that the needling route could avoid nerves, large vessels and hollow organs, followed by the measurement of needling depth and angle. After conventional sterilization and drape, 2% lidocaine was administrated for local anesthesia. Under CT guidance and subject to the pre-measured needling depth and angle, the lesions were punctured fractionally using Chiba needle of 18~22 G, PTC needle or porous ethanol injection needle. Intralesional liquid ingredients, if any, should be drawn out to the greatest extent. According to the size of lesions, emulsion consisting of ultra-liquid iodized oil, anhydrous ethanol and 50 mg of oxaliplatin (formulated as a liquid with 5% glucose, where the dosage should be determined according to the lesion size and patient surface area) in the proportion of 1:2:2 was slowly injected to the lesions. Based on the dispersion situation of drugs within the lesions observed by intermittent CT scanning during the injection process, the injection amount and the puncture point were adjusted.so as to fill the lesions with drugs to the greatest extent. The needle was removed once the required limits were reached, and the pinholes were closed with applicator. For those with tumor of larger size, the second and the third treatments were performed 1 week or 1 month later.

*Efficacy evaluation*

The postoperative follow-up was conducted in all patients and the content involved the improvement in symptoms and signs, pelvic ultrasound, CT or MRI, blood routine, blood biochemistry, tumor markers, etc. The changes in imageological tumor volume (i.e., the product of two mutually perpendicular maximum diameters before and after the treatment) were compared in four situations: 1) complete recovery or merely residual fibrous cords or calcified shadow; 2) reduced lesions, where the product was reduced by ≥ 50% after the treatment compared to that before surgery; 3) unchanged lesions, where the product was reduced by < 50% or increased by < 20% after the treatment; and 4) increased lesions, where the product was increased by ≥ 20% after the treatment [3]. The efficacy was evaluated comprehensively based on clinical symptoms, signs, tumor markers and other indicators.

*Statistical analysis*

Software SPSS 15.0 was used for statistical analysis and *t* test for the comparison of measurement data, where $P < 0.05$ was considered as statistically significant difference.

## Results

23 of these 78 cases were reported with merely residual fibrous cords or calcified shadow or

complete recovery, the lesion volume was reduced in 55 cases, and no patients with unchanged or increased lesions were reported, indicating a total effective rate of 100% (78/78). The tumor size after treatment was significantly reduced compared to that before treatment [(4.5 ± 1.9) $cm^2$ vs (20.6 ± 10.1) $cm^2$], and the difference was statistically significant ($P$ = 0.018). Of 34 patients suffering from pain in perineum, buttocks and/or legs and limited mobility of the lower extremities, relieved symptoms were reported in 21 cases and eliminated pain in 13 cases. CEA decreased in 40 patients with increased CEA before surgery, and the CEA level recovered to normal level in 16 patients. No intraoperative and postoperative complications were observed. The postoperative follow-up lasted for 2~51 (22.4 ± 6.6) months, and 25 patients were followed up for more than 36 months; no deaths occurred during the follow-up period.

## Discussion

Patients with advanced malignant tumors tend to have pelvic metastases, most of which are hypovascular [4]. All 78 cases in this study were patients, who underwent regular chemotherapy and developed abdominal or pelvic metastases within 1-3 years after surgery. CT-guided percutaneous chemical ablation was applied for situations, where patients were unwilling to undergo reoperation, or related departments considered the lesions were unsuitable for surgery temporarily, or the treatment efficacy of hypovascular lesions using vascular intervention therapy was poor. The main mechanism of percutaneous chemical ablation is to directly target the drugs to tumor tissue and affect the survival environment of tumor cells through inducing their necrosis and disintegration or interfering with tumor metabolism, thus achieving the purpose of treatment. It has been proved to be a safe and effective complementary therapy method [5]. In this study, oxaliplatin, anhydrous ethanol and ultra-liquid iodized oil were made into suspension in certain proportion based on their different properties, and the suspension was directly injected into the tumor under CT guidance to inactivate the tumor regionally and locally. The efficacy of this method proved to be good. Oxaliplatin is the third generation of platinum antitumor drugs and belongs to cytostatics. It acts upon DNA through generating hydration derivatives and thus forms the within-chain and inter-chain crosslinking, which contributes to the inhibition of DNA synthesis and the production of cytotoxic effect and anti-tumor activity. This drug is mainly used for the treatment of colorectal cancer, advanced ovarian cancer, etc [6].

Anhydrous ethanol can denature, dehydrate and coagulate cancer cells, thus directly destroying cancer cells and causing tumor necrosis; macromolecular bioactive substances (e.g., tumor angiogenesis factor) produced by destroying malignant cells will further promote the thrombogenesis within tumor blood vessels and lead to a secondary killing effect. This fast-acting and price moderate drug is also featured with no viscosity and easy injection for puncture needle [7]. As the carrier, ultra-liquid iodized oil can deliver chemotherapy drugs from the injection site to adjacent region of lesion; moreover, once mixed with ultra-liquid iodized oil, chemotherapy drugs can be released slowly because of the wrapped oil, where the ultra-liquid iodized oil functions as a moderator. Besides, ultra-liquid iodized oil can also play a tracer role that helps to determine the injection volume [8].

The results of this study showed that 23 of these 78 cases were reported imageologically with complete recovery or merely residual fibrous cords or calcified shadow or complete recovery, the lesion volume was reduced in 55 cases, and no patients with unchanged or increased lesions were reported. The tumor size after treatment was significantly reduced compared to that before treatment, and the difference was statistically significant ($P$ = 0.018). In those patients suffering from pain in perineum, buttocks and/or legs and limited mobility of the lower extremities, relieved symptoms were reported in most cases and eliminated pain were reported in 13 cases. CEA decreased in part of patients with increased CEA before surgery, and the CEA level recovered to normal level in 16 patients, suggesting a significant efficacy; no deaths occurred during the follow-up period. It can be concluded that CT-guided percutaneous chemical ablation is featured with advantages of fewer complications, less damage to normal tissues and high reproducibility in treatment of pelvic hypovascular metastasis; considering its ability to destroy tumors in situ and maximize the protection of body and organ functions, this method is worthy of clinical promotion and application.

## Disclosure of conflict of interest

None.

**Address correspondence to:** Hong-Min Zhou, Department of Imaging, Jining Cancer Hospital, 272000, Shandong, China. Tel: +86-0537-3202396; Fax: +86-0537-3202396; E-mail: hongminzhoudoc@yeah.net

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