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Combined percutaneous radiofrequency ablation and cementoplasty for the treatment of extraspinal painful bone metastases: A prospective study

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ABSTRACT

Introduction: About 50% of patients with cancer develop bone metastasis mainly presenting with distressing, drug-resistant pain.
Aim of the work: The study evaluated efficacy and safety of combined cementoplasty and bony radiofrequency ablation in palliation of intractable pain and disability in cancer patients with bony metastases.
Patients and methods: The study included 30 adult patients suffering from localized bony metastases causing refractory moderate to severe pain. Radiofrequency bony ablation performed followed by cementoplasty were done under computed tomography (CT) guidance with conscious sedation and local anesthesia. Final CT check was done to ensure adequate lesion filling and to exclude any cement leakage. Pain, hemodynamic variables, and neurological status were checked for a minimum of 2 h before discharge. The patients were followed up weekly in the pain clinic. The primary outcome measures pain severity and daily opioid consumption. The secondary outcome measures were quality of life and the degree of disability, and procedure-related adverse outcomes.
Results: Pain score, daily morphine consumption, and Oswestry Disability Index score decreased significantly after 1 day, and 1, 4 and 12 weeks. None of the patients had serious complications during the postoperative follow up visits. Only 4 patients (13.3%) experienced discomfort during, and few days after the procedure, 3 patients (10%) suffered from local infection, and 2 patients (6.7%) reported cement leakage.
Conclusion: Combined radiofrequency ablation and cementoplasty is a safe and effective pain relief modality in patients suffering from extraspinal painful bone metastases with improvement of the quality of life.

Introduction

The number of cancer patients presenting with bone metastasis has been increasing over the years. It is estimated that about 50% or more of patients with cancer develop bone metastasis; more commonly in patients with breast, prostate, and lung cancers [1]. The spine is the most common site of bone metastasis followed by the pelvis, ribs, and proximal femur. More distal parts of the body as the scapula, skull, humerus, clavicle, tibia, and fibula were uncommon sites of bone metastasis [2].

Distressing, drug-resistant pain is the main symptom of bone metastasis [3]. Uncontrolled pain disturbs mobility and remarkably interferes with daily activity and quality of life [4]. Currently available therapeutic modalities to treat cancer pain include specific anticancer therapy, analgesic drugs, neurostimulation techniques, and invasive procedures including regional analgesia, axial narcotics, injection of neurolytic agents, ablative neurosurgical techniques and cementoplasty [5].

Radiofrequency (RF) ablation is a relatively new method that has been employed for treatment of hepatocellular carcinoma (HCC), liver metastases, and osteoid osteoma [6,7]. Percutaneous cementoplasty is a new and minimally invasive technique that has been shown to alleviate pain and reduce metastatic activity in addition to stabilizing the affected bones [8]. Cementoplasty was reported to produce pain reduction in 80 to 97% of cases whatever the bone site treated; whether vertebrae, long bones or flat bones [9].

The aim of this study was to evaluate the efficacy and safety of combined cementoplasty and bony radiofrequency ablation in palliation of intractable pain and disability in cancer patients with bony metastases.

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Patients and Methods

The study was conducted at the National cancer institute (NCI), Cairo University, Egypt from December 2014 to September 2016. The study was approved by the Institutional Review Board of the NCI. During the study period, every patient attending the pain clinic and fulfilling the inclusion criteria was consecutively invited to participate in the study. Thirty patients were included and completed the 12-week follow up period. The risks of the procedure were discussed thoroughly, and all the patients were asked to sign a written informed consent.

Patients were included if 18 years or older with recent radiological evidence of bone metastases involving flat bones of the rib cage, iliac wings, the superior pubic or ischiopubic rami, long bones, cancellous bones excluding the cervico-dorso-lumbar vertebrae. Patients suffering from moderate to severe pain (pain score > 40 on a 100-mm visual analog scale) refractory to conservative measures including rest and analgesics including paracetamol, ibuprofen and oral morphine sulfate given in the highest tolerable dose for at least four weeks were included.

Patients with diffuse painful bone metastases, systemic or local infection including osteomyelitis, uncorrected coagulopathy, hypersensitivity to bone cement and severe medical co-morbidity were excluded from the study.

Procedure

Ceftriaxone 1 g was administered intravenously 30 min before the procedure. The procedure was done in the prone or the supine position according to the site of the lesion with special care of soft padding of the geriatric osteoporotic patients. The procedure was done under computed tomography (CT) guidance with CT slices 3–5 mm according to the case to determine the lesion's exact location and depth, in relation to the overlying skin.

The procedure was conducted under ASA recommendations of conscious sedation using intravenous midazolam in a dose of 0.05 mg/kg plus intravenous fentanyl in a dose of 1 μg/kg. Supplemental doses of intravenous propofol were allowed in increments of 20 to 30 mg as required during radio-frequency ablation and injection of cement. The field was sterilized using povidone iodine, and sterile drapes were applied. The target bony lesion was identified using CT garnity. Radiofrequency bony ablation was performed using a radiofrequency machine (AngioDynamics, RITA Medical Systems, Model 1500X, California, USA, Fig. 1) that included the radio-frequency generator, RITA thermopads/dispersive electrodes, and a ground plate. The RITA needle used had a single 17-gauge straight tip, and triple-cluster electrodes internally cooled with a chilled saline solution during ablation. The active exposed tips were 4 mm length.

Fig. 1. Radio-frequency machine (AngioDynamics, RITA Medical Systems, Model 1500X, California, USA).

Fig. 2. Cementoplasty kit (Mendec spine kit, Tecres, Italy).

Cementoplasty was performed using a standard cementoplasty kit (Mendec spine kit, Tecres, Italy, Fig. 2) that included a specific delivery system and the liquid monomer and powder polymer components of polymethylmethacrylate (PMMA) bone cement to be applied.

After initial CT scanning of the painful bony lesion (Fig. 3), a 10 cm long, 11 gauge or 13 gauge bone needle was used to accommodate the 17 gauge RITA needle and to avoid the jet expulsion of cement under high pressure associated with smaller-sized needles. A beveled needle was used to allow accurate control and manipulation of needle path and side deposition of bone cement.

Local anesthetic was applied via a 22 gauge spinal needle using 10 ml of 1% lidocaine. The skin incision was done to accommodate the large diameter bone biopsy needle. Stepwise insertion of the bone biopsy needle was done guided by CT cuts. Needle advancement was facilitated by a continuous twisting motion or tapping with a sterile hammer until the proper depth was reached. The final endpoint was verified by the scanogram (Fig. 4). Venography was done using 2–3 ml of contrast medium (Omnipaque, Iohexol 300 mg I2/ml) to verify the final position of the needle tip and to exclude vascular leakage and to predict the spread of the injected bone cement.

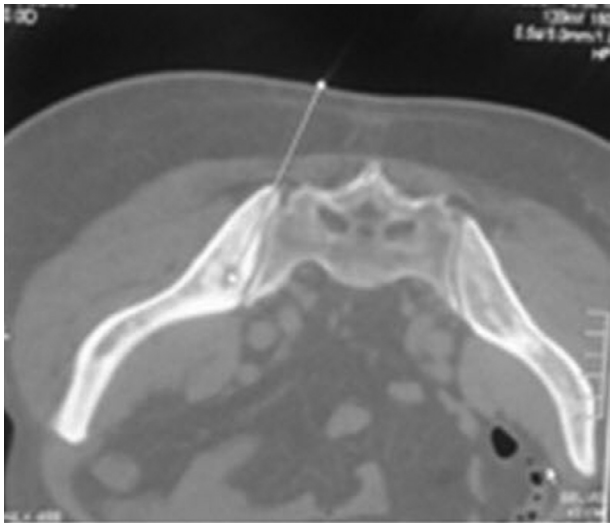

Fig. 3. Initial CT scanning of the painful bony lesion and planning for the bone biopsy needle insertion.

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