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Original Article

# Outcomes of embolization of bone tumors in the pelvic and shoulder girdles: Initial experience

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## ARTICLE INFO

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## ABSTRACT

**Purpose:** To assess the effectiveness of transarterial embolization of bone tumors as preoperative technique to reduce blood loss or as a curative method in bone tumors of shoulder and pelvic girdles.

**Patients and methods:** The study included 25 patients with different bone tumors which are benign tumors (n = 16) and bone metastasis (n = 9). Their ages ranged from 6 to 65 years. Embolization was a palliative treatment in bone metastasis (n = 9), non-ossifying fibroma (n = 2) and osteoblastoma (n = 1). In patients with ABCs (n = 12) and osteoblastoma (n = 1), the technique was used as a curative method. The effectiveness of the technique was assessed using plain X-ray of the affected region, CT scan, CT angiography.

**Results:** In 7 patients operated, reduction of blood loss reached about 400 mL. No perioperative complication or wound complications. Additionally surgery was easier. In the remaining 18 patients tumor regression in (ABCs n = 12, osteoblastoma n = 1) and pain reduction (metastasis n = 5) were detected during the follow up period 1–2 years.

**Conclusion:** Preoperative embolization is useful in reduction of intraoperative blood loss in tumors at shoulder and pelvic girdles. The technique is considered curative method in inaccessible lesions of pelvic and shoulder girdles with multiple interlacing vascular anastomosis.

## 1. Introduction

Different bone tumors are classified either primary or metastatic. There are different lines of treatment according to type of the tumor. Generally, the best line of treatment is surgery with other additional therapies. However, surgery may be difficult in certain bony neoplasms either due to large tumor size, highly vascularized tumors or the relation of the tumor to nearby vital structures and difficult surgical approach. Transarterial embolization (TAE) is the first adjuvant therapy in most of the bone tumors. In certain patients, it may be the only curative method of treatment [1].

Different indications for transarterial embolization (TAE) in bone tumors are: to reduce operative blood loss, to make surgery simple and definitive, or relief pain, fever and bleeding that result from the tumors. Embolization may also increase tumor response to chemotherapy or radiation therapy. The surgical procedure is difficult in certain sites with significant risks to anatomical nearby structures. So TAE is a part of a wider treatment strategy [2].

This study was constructed mainly to reveal the effectiveness, outcomes and reliability of embolization of bone tumors either as

definitive treatment or palliative treatment for reduction of intra-operative blood loss or relief of tumor associated pain.

## 2. Patients and methods

This study is a prospective study performed in the angiography and interventional unit of Mansoura University Hospital (MUH), Mansoura, Egypt, in the period from December 2014 to May 2017. This study include 25 patients (15 males and 10 females) with different pelvic and shoulder girdle bone tumors which are ABCs (n = 12), metastasis from HCC (n = 7), metastasis from RCC (n = 1), metastasis from thyroid carcinoma (n = 1), osteoblastoma (n = 2) and non-ossifying fibroma (n = 2). Their ages ranged from 6 to 65 years and mean age of 31.9 years. They were referred from Orthopedics Department of the same hospital.

All patients underwent plain X-ray of the affected region, computed tomography and magnetic resonance imaging using different pulse sequences in different planes, as well as pre and post contrast study. Four patients had history of HCC, 1 had history of RCC and 1 had history of thyroid carcinoma. The final diagnosis of ABC (n = 12) was based on

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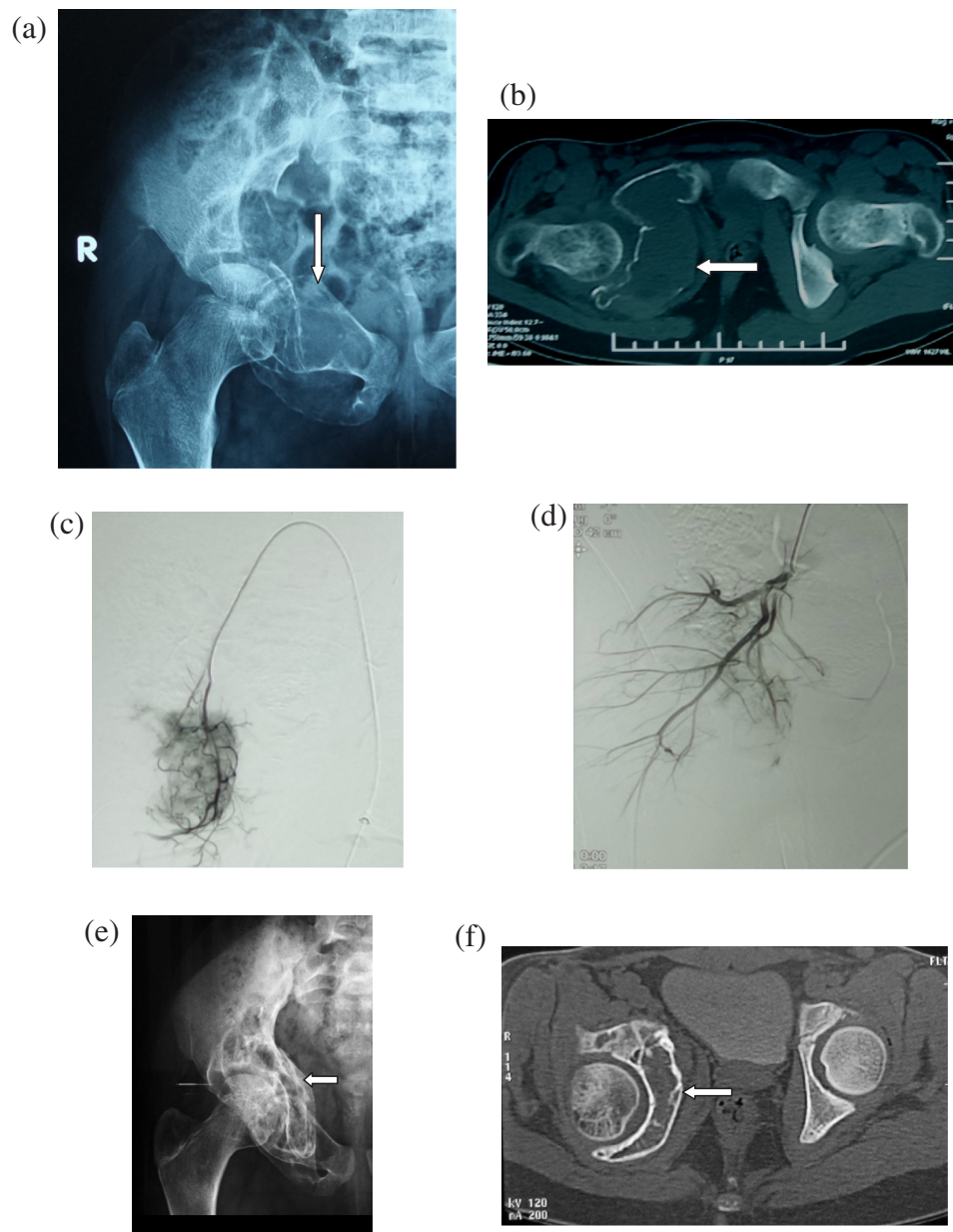
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**Fig. 1.** ABC at right acetabulum and right pubic bone underwent curative embolization. (a) Plain X-ray of right hip joint demonstrates the lesion (arrow). (b) Axial CT demonstrates expansile aggressive ABC (arrow). (c) Preembolization angiogram of Rt. internal iliac artery shows tumor blush with microcatheter is then advanced into tumor feeding artery. (d) Postembolization angiogram shows absent tumor blush. (e) Follow up after 6 months plain X-ray at AP view reveals tumor shrinkage with sclerotic margin. (f) Follow up after 2 years axial CT reveals persistent tumor shrinkage and evident sclerosis.

the imaging findings in both CT and MRI. Seven patients (HCC  $n = 3$ , osteoblastoma  $n = 2$  and non-ossifying fibroma  $n = 2$ ) are proved pathologically by core biopsy.

Multiple simple laboratory tests were performed before the procedures for safe angiography and embolization including; prothrombin time and concentration (International Normalized Ratio or INR), partial thromboplastin time, platelets count, hemoglobin and serum creatinine.

Angiography and embolizations were performed in the angiography room using Allura Xpera FD 20/20 (Philips Medical system, Cleveland, USA); under local anaesthesia using 10 mL xylocaine (2% lidocaine hydrochloride). We used transfemoral route in all patients, right femoral route was used in 13 patients while the left femoral route was used in 10 patients using cross over technique and both routes were used in 2 patients. Pre-embolization angiogram was obtained in all patients to assess the degree of tumor vascularity and the supplying artery or arteries.

Both angiography and embolization were completed using 5F cobra head catheters in 7 patients, while in 18 patients embolization was completed using microcatheters and coaxial system, where 2.7F (Terumu Progreat) microcatheter was used to reduce the chance of non-target embolization. Proper catheter selection is needed preembolization angiogram and subsequent good definition of feeding arteries (5 French cobra head catheter). In case of small arterial feeder to the tumor utilization of coaxial microcatheter (2.7 F) is mandatory to attain more distal embolization. Proper selection of embolizing particles (300–500 and 500–700  $\mu\text{m}$ ) of PVA which is easier to be used rather than other liquid embolic materials. Injection of embolic particles must be done under fluoroscopic control to avoid reflux in non-targeted vessel. The mean time of the procedure was 80–150 min.

Selective and superselective intraarterial embolization was used as a curative treatment in 13 patients (ABCs  $n = 12$  and osteoblastoma  $n = 1$ ). While preoperative intraarterial embolization was used in 7

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