THE INTEREST OF RADIO GUIDED SURGERY IN LUMBAR SPINE OSTEOBLASTOMAS RESECTION
INITIAL EXPERIENCE OF CHU BAB EL OUED

I. ASSOUMANE[1], M. AL-ZEKRI[1], D. AOUDIA[1], R. BABA AHMED[2], A. SIDI SAID[1]

1: Department of Neurosurgery CHU Bab El Oued Algiers
2: Department of histology CHU Bab El Oued Algiers

RÉSUMÉ : ***Objectifs :*** Evaluer l'intérêt de la radio détection per opératoire dans la résection totale d'une tumeur rachidienne. ***Matériels et méthodes:*** Nous rapportons deux cas d´ostéoblastomes lombaires chez des jeunes, nous avons utilisé le score de Enneking sur les tumeurs bénignes musculo squelettiques qui a trois catégories : lésion latente, active et agressive. Les deux patients ont bénéficié de radiographies simples du rachis lombaire, de TDM et IRM lombaires ayant objectivé des lésions ostéolytiques. La scintigraphie osseuse a permit de localiser de façon précise la lésion. Résultats: Les deux patients ont respectivement 18 et 17 ans. Les signes cliniques communs étaient les lombalgies. Nous avons utilisé en per opératoire en collaboration avec l´équipe de médecine nucléaire l´europrobe qui est un appareil de détection d´irradiation pour faire une exérèse totale de la tumeur. Le suivi moyen est de cinq ans et il n'y a pas eu de récidives tumorales après contrôle clinique et radiologique. ***Conclusion :*** L´ostéoblastome est une tumeur bénigne qui doit être réséquée totalement pour éviter tout risque de récidive. Le contrôle per opératoire à l´aide du nuclear probe est simple et reproductible, il permet de vérifier l'exérèse complète de la tumeur.

Mots clés : *Ostéoblastome, Radio detection, Technetium bone scan.*

ABSTRACT : ***Objectives :*** The interest of the two cases is the support of the radio detection preoperatively to confirm the total removal of spine tumor. ***Materials and methods :*** We report two cases of lumbar osteoblastomas in young patients; we use the Enneking staging system for benign musculoskeletal tumors which consists of three categories: latent, active, and aggressive. The two patients are evaluated by simple x ray; CT scan and MRI showing a lumbar osteolytic lesion. The technetium bone scan allowed a precise localization of the lesion. Results: The two patients are an 18 years old girl and 17 years old boy Low back pain is the common presentation; Modern imaging and the collaboration with nuclear physicians allow clear investigations. In the two cases surgical planning with per operative control of the tumor-site guided a complete removal; we use in collaboration with the team of nuclear medicine, the surgical nuclear probe «Europrobe». The mean follow up is 5 years and no recurrence after imaging control. ***Conclusion :*** Osteoblastoma is a benign tumor requiring a total removal to avoid recurrences. The per operative radio control using the nuclear probe is simple and practical use. It allows asserting the complete total excision.

Keywords : *Osteoblastoma, Radio detection, Technetium bone scan, Nuclear probe.*

INTRODUCTION

The term osteoid osteoma was first used by Jaffe in 1935 to describe a benign bone tumor. Jaffe and Lichtenstein proposed in 1956 the term «benign osteoblastoma» for both tumors [1, 2, 3]. Osteoblastomas and osteoid osteoma are usally considered as a same pathological entity because they are histologically similar.

Osteoblastoma is a rare benign primary bone tumors accounting about 3% of benign and 1% of primary bone tumors [1, 4, 2]. It occurs in the second to third decades of life, and is slightly more frequent in males.

We report two cases of bone tumors located on the lumbar spine. The investigations include plain x-rays, CT scan, MRI, bone scan.

Total removal of the tumor has been guided by surgical nuclear probe.

CASES REPORT

Observation 1

We present a case of an 18 years old girl, student, who consulted for right sided lumbar pain, worse at night and persistent despite analgesics. On the lumbar plain x-rays the right L5 pedicle is not visualized.

The CT scan (Fig. 1) showed a complete lytic image eroding the cortex with calcifications. The margins were not well defined confirming the aggressiveness of the tumor. On the lumbar MRI there is no extension or effects of tumor on the spinal cord.

The day before surgery, the nuclear medicine team injected 12mCi of HMDP labeled with technetium 99m. It is a bone seeking agent which will be uptaken by the osteoblasts (half life of 18 hours). The bone scan is done one day before surgical intervention and demonstrated an intense focal accumulation of the bone-seeking agent in the right lumbar 5 lamina (Fig. 2).

We operated the patient and total excision of the lesion was done with the control of surgical nuclear probe. The signal coming from the osteoblatoma was detected and located easily by the surgical nuclear probe. After the initial resection, radioguided check allowed to complete the surgery and excise all possible remnants tissues (Fig. 3).

We performed a laminectomy and a right L5-S1 stabilization with posterior instrumentation. The histological exam revealed an osteoblastoma

After 9 years of follow up there is no complain and no recurrence on the radiological investigations (Fig. 4 and 5).

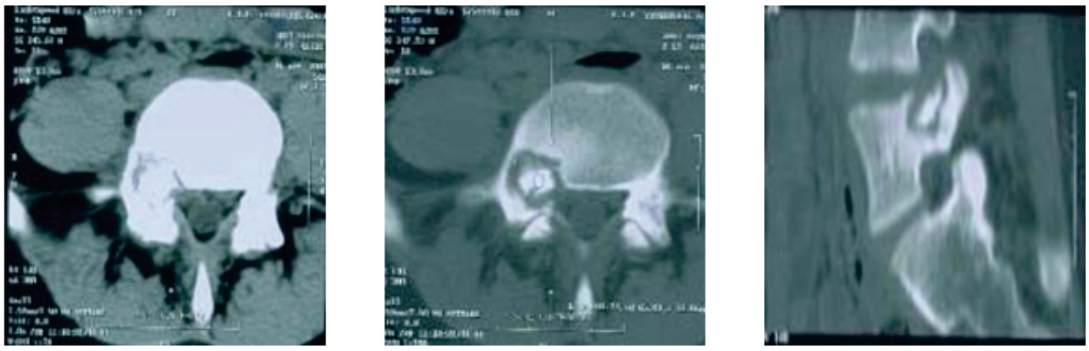

Fig. 1 : axial CT showing a fully lytic image eroding the cortex The margin is not well defined confirming the aggressiveness of the tumor calcifications.

Fig. 2 : Technetium bone scanning demonstrates an intense focal accumulation of the bone-seeking agent on L5

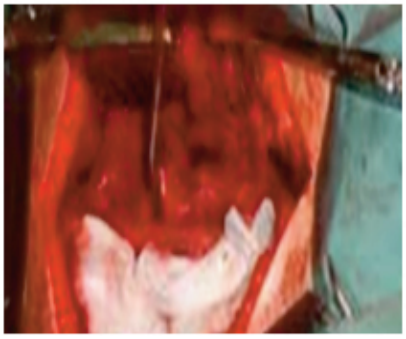

Fig. 3 : Intra operative image showing the detection probe

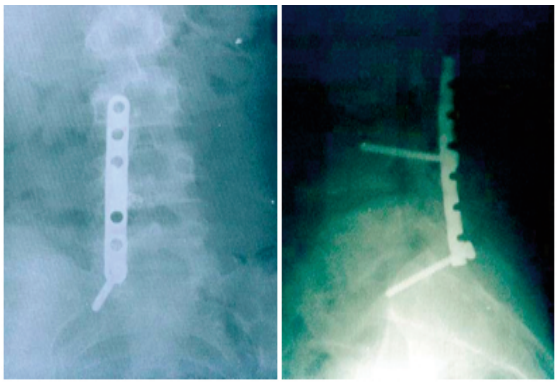

Fig. 4 : Lumbar X Rays showing the material of fixation after surgery

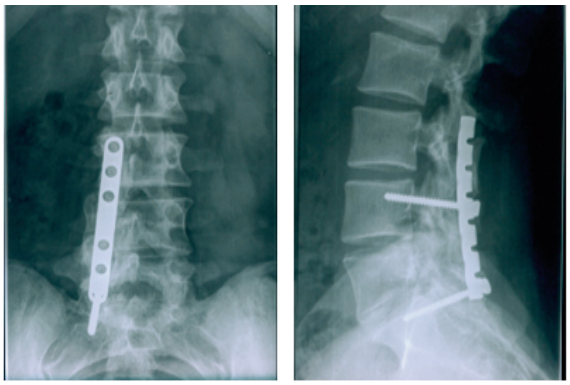

Fig. 5 : Lumbar X Rays showing the material of fixation 9 years after : no recurrence of the tumor

OBSERVATION 2

The second case is a fifteen years old boy who consulted for lumbar pain for one year worsening since one month. The neurological exam found bilateral cruralgia.

The lumbar CT scan showed a right L3 osteolytic tissue lesion on the lamina sized 21 x 11 mm blowing the anterior cortical and slightly pushing back the dural sheath (Fig. 6)

Enneking´s classification [6] is stage 2.

The Technetium bone scanning done the day before surgical intervention demonstrated an intense focal accumulation of the bone-seeking agent in the right lumbar 3 lamina. (Fig. 7).

We operated the patient and performed a decompression of the spinal cord by laminectomy and piecemeal resection of the tumor. we achieved total resection of the lesion with the control of surgical nuclear probe. The histological diagnosis is osteoblastoma (Fig. 8).

Ten days after surgery the patient had no complain, we remove sutures and discharge him from the hospital.

At time, so one year after the operation he is free of lumbar pain.

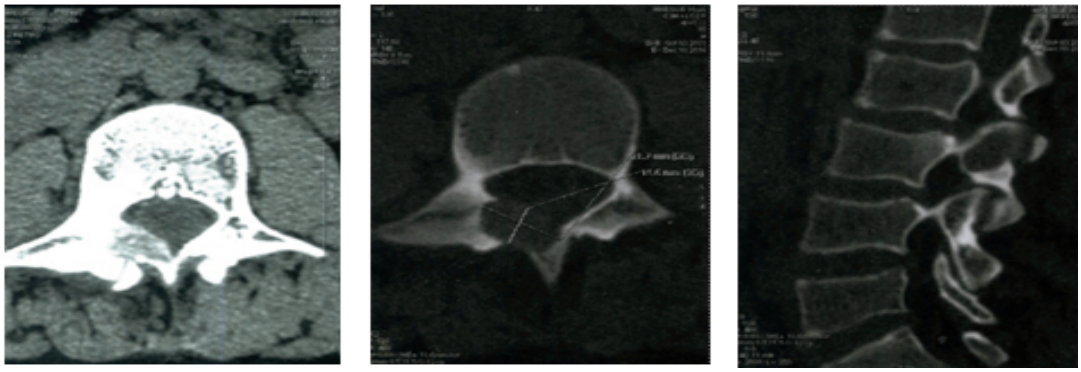

Fig. 6 : Axial and Sagital lumbar CT with reconstruction showing the lytic lesion on right L3 lamina

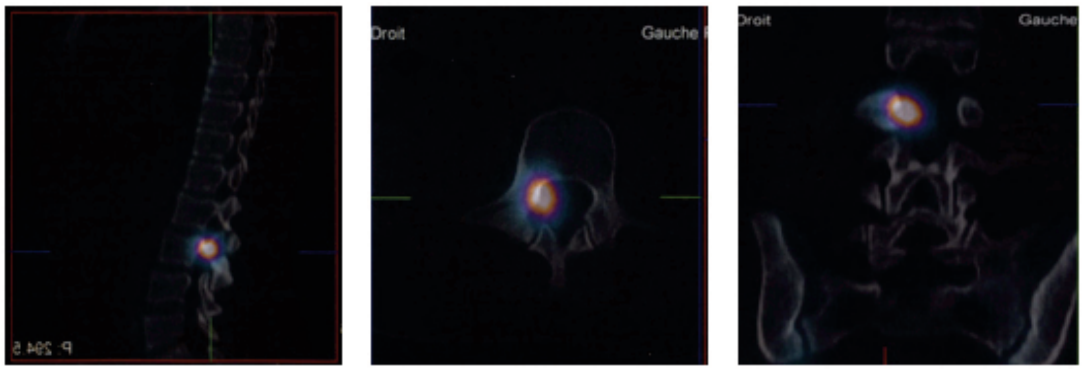

Fig. 7 : The Technetium bone scanning (sagital, axial, coronal) showing the intense focal accumulation of the bone-seeking agent in the right lumbar 3 lamina

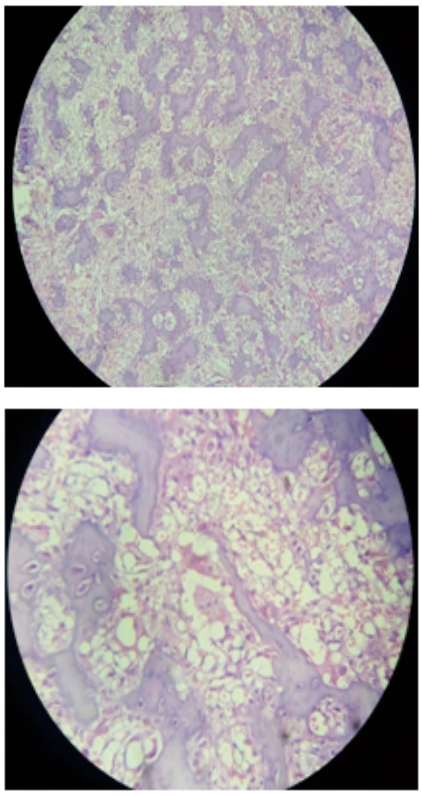

Fig. 8 : Histopathology : The microscopy objectifies bone tumoral proliferation which is organize in spans of osteoid material. They are surrounded by regular osteoblast edging with rounded nucleus and small nucleolus without marked cytonuclear atypie. Systematic osteoclastic giant cells are present. Conclusion: osteoblastoma

DISCUSSION

Osteoblastomas are rare bone tumors, they represent 1% of all bone tumors, and 30 to 40% are localized to the spine. They encompass 10% of all osseous spinal neoplasms [1, 4, 5]. Osteoblastomas tend to predominate in the pediatric population during the second decade of life [1, 4, 5, 7, 8, 12] which is the case of our patients. Symptoms consist of progressive bone pain less likely to be relieved by aspirin or other analgesics [1, 4, 5, 6, 8].

The tumors involved the posterior elements of the spine [4, 5] like in our 2 cases.

The most effective treatment for spinal osteoblastoma is en bloc resection of the tumor, to avoid recurrence [5, 11, 12].

Spinal decompression therapy needs to be adopted when spinal cord or nerve root compression is present.

When the tumor exposure is difficult, a piecemeal resection has to be performed to achieve the necessary extent of resection [4]

Spinal reconstruction is necessary to restore the spinal stability if the lesion involved pedicles facet joints, and anterior segment [4] which is the case of in the first patient while it affected the lamina in the second.

Radiotherapy and chemotherapy, either alone or combined, may be useful in selected patients with recurrent, aggressive tumors, or in patients with a surgically no resectable lesion [4, 7, 11].

Osteoblastomas have the possibility of malignant transformation to osteosarcoma, but malignant transformation has only been reported in rare cases [4, 7, 10].

In differential diagnosis of osteoblastoma, osteosarcoma, giant cell tumor and aneurismal bone cyst must be considered .

Treatment depends on localization, size and stage of tumor at the time of diagnosis. While in stage 1 (latent phase) or stage 2 (active phase) osteoblastoma, intra lesional curettage is advised ; marginal or wide resection is required in stage 3 (aggressive phase).

Although complete resection of the tumor is essential to prevent recurrence, long term follow up is essential because of considerable recurrence rate, reported as 10 to 15% of cases [8].

Absolute excess risk estimates are necessary to put the risks into perspective with the benefits of the scans. Good evidence from the long-term study of the atomic bomb survivors in Japan suggests that cancer risk persists indefinitely after radiation exposure and most cancer types are inducible by radiation.

The most recent risk projections suggest that, for children with normal life expectancy, the lifetime excess risk of any incident cancer for a head CT scan

(With typical dose levels used in the USA) is about one cancer per 1000 head CT scans for young children (<5 years), decreasing to about one cancer per 2000 scans for exposure at age 15 years. For an abdominal or pelvic CT scan, the lifetime risks for children are one cancer per 500 scans irrespective of age at exposure. These absolute excess lifetime cancer risks (to age 100 years) are very small compared with the lifetime risk of developing cancer in the general population, which is about one in three, and are also likely to be small compared with the benefits of the scan, providing it is clinically justified.

Frequent calls have been made to decrease doses, following the as low as reasonably achievable (ALARA) principle and only scan when justified as in the current image

gently campaign. In the UK, the Ionizing Radiation (Medical Exposure). Regulations mean that a CT scan should only be done when clinically justified, which might explain the low levels of CT use in the UK compared with other countries that do not have such regulations. The immediate benefits of CT outweigh the long-term risks in many settings and because of CT's diagnostic accuracy and speed of scanning, notably removing the need for anesthesia and sedation in young patients, it will remain in widespread practice for the foreseeable future. Further refinements
to allow reduction in CT doses should be a priority, not only for the radiology community but also for manufacturers. Alternative diagnostic procedures that do not involve ionizing radiation exposure, such as ultrasound and MRI might be appropriate in some clinical settings [13].

CONCLUSION

Osteoblastomas are primary osseous neoplasm with a predilection for the spine. They are rare tumors which may be aggressive, with a tendency to local recurrence and sometimes metastasis. Aggressive radical resection is the preferred treatment for these osseous tumors. That can be achieving through a radio guided surgery.

It is an attractive method guided by both morphologic and functional images we think about the possibility to extend this method to others indications like bone metastasis with compression.

REFERENCES

1]. MICHAEL A. GALGANO, CARLOS R. GOULART, HANS IWENOFU, LAWRENCE S. CHIN,WILLIAM LAVELLE, AND EHUD MENDEL, Osteoblastomas of the spine: a comprehensive review Neurosurg Focus Volume 41 August 2016

2]. Z. R. POLEKSIC, V. J. LALOSEVIC, Z. B. MILINKOVI Osteoblastoma of the spine UDK 616.711-006.34, DOI:10.2298/ACI1001063P, ACI Vol. LVII

3]. KIRWAN EOG,; HUTTON PAN,; POZO JL,; ET AL. Osteoid osteoma and benign osteoblastoma of the spine. Clinical presentation and treatment. J. Bone Joint Surg 1984; 66–B (1): 21–6 ...

4]. LI Z, ZHAO Y, HOU S, MAO N, YU S, ET AL. (2013) Clinical Features and Surgical Management of Spinal Osteoblastoma: A Retrospective Study in 18 Cases. PLoS ONE 8(9): e74635. doi: 10. 1371/ journal. pone.0074635

5]. SANJAY YADAV, ANKUR GOSWAMI, G VIJAYRAGHAVAN, ARVIND JAYASWAL An uncommon giant osteoblastoma in a young child Our experience and literature review. J. Spinal surg 2015; 2(1):17-19

6]. MICHAEL G. RHODE, DAVID R. LUCAS, CYNTHIA H. KRUEGER, AND ROBERT T. Pu. Fine-Needle Aspiration of Spinal Osteoblastoma in a Patient With Lymphangio matosis.Diagnostic Cytopathology, Vol 34, No 4 2006 WILEY-LISS, INC.

7]. HAKAN EMMEZ , MENDUH KAYMAZ, NIL TOKGOZ, GULDAL YILMAZ; GOKHAN KURT Progression of a lumbar spinal osteo blastoma case report Neurol Med Chir (Tokyo) 45,379-383, 2005

8]. SVJETLANA MUJAGIĆ, MAIDA KULJANIN, ASMIR HRUSTIĆ A spinal osteoblastoma in a child, situated in the vertebral body – CT and MR imaging: case report Paediatrics Today 2016; 12(1):97-101; DOI 10.5457/p2005-114.142

9] CAN SOLAKOĞLU, SELAHATTIN ÖZYÜREK, OSMAN RODOP, ERKAN KAYA, M. DURUSU A rare cause of chronic low back pain: osteoblastoma of the lumbar spine. Nadir Bir Kronik Bel Ağrısı Nedeni : Lomber Omurga Osteoblastoma

10] MEHMET ZILELI, SEDAT CAGLI, GÜLÇIN BASDEMIR, AND YUSUF ERSAHIN Osteoid osteomas and osteoblastomas of the spine Neurosurg Focus 15 (5): 5, 2003

11] PAVAN KUMAR AVADHANAM, SREEDHAR VUYYUR, MANAS KUMAR PANIGRAHI. A rare occurrence of osteoblastoma in a child. 154/J. of Pediatric Neurosciences / V.5 / Jul-Dec / 2010

12] KIVANC I. ATESOK, BENJAMIN A. ALMAN, EMIL H. SCHEMITSCH, A. PEYSER, Osteoid Osteoma and Osteoblastoma .J. Am Acad Orthop Surg 2011; 19: 678-689