Percutaneous Biopsy of Spine Metastases

ABSTRACT

Many malignancies in elderly population are firstly presented by spine metastases. Taking into account the complexity of metastatic diseases, it is very important to complete tumor staging and determine its pathohistology. In this paper, we present a group of patients on which a percutaneous biopsy of tumor at the Department of orthopedics and traumatology in Sarajevo was made. Including factors were: X-ray, CT or MRI diagnosed spine metastasis of thoracic or lumbar spine of unknown origin. Needle biopsy in local anesthesia was performed on 25 patients in total, and on 21 of them, we confirmed histological metastatic disease (84%). Other four patients had inadequate material for analysis and we had to repeat the procedure. Spine surgery was indicated in 8 of 25 patients (32%). Metastatic disease advanced to the rest of them (68%) and they were only indicated with chemo/radio-therapy (low Tomitta score and short life expectancy). Despite the presence of many metastases, the most symptomatic are spinal metastases. Therefore, other specialists expect orthopedic-trauma spine surgeons to be leaders of the team, although it should be oncologists. Percutaneous spine biopsy allows the acceleration of diagnostic procedure, and, as soon as possible, the beginning of definite therapy.

KEY WORDS:

spine, metastasis, biopsy, pathohistology, needle.

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Introduction

When traumatic spine fractures occur, we first think of osteoporotic or metastatic spine fractures. Reason for common localization of metastases in spine is the Baxter's plexus. Baxter's plexus connects drainage area of upper and lower cava vein, similar like azygos veins, from occiput to sacrum. It has no valves and intraabdominal pressure of toraco-abdominal space does not change pressure in it, since it is located mostly in vertebral bodies.

Stability of spine column can be reduced by a pathological process: osteoporosis, hemangioma, multiple myeloma, metastasis (prostate, kidney, breast, rectum, ventriculus). Pain is minimal at the beginning, and is increased after some event – sudden sitting down, falling in house, lifting of heavy object, etc.). Neurological symptoms appe-

ars latterly, when compression of medulla or nerve roots become extensive.¹

Standard X ray imaging can present marked lytic lesion (hemangioma) or irregular lesion (myeloma or metastasis). X ray imaging is positive just after 60% of bone mass is destroyed, and it is not reliable to differentiate an acute from chronic lesion. CT scan allows better visualization of fracture geometry and relation of bone and medulla. It is also rather inconclusive regarding to fracture etiology (osteoporosis, benign or metastatic bone lesion). MRI presents real size of metastasis and its relation to the surrounding tissues (medulla, aorta, v. cava).²⁻⁵ (Figure 1.) Scintigraphy is very useful for detecting and numbering of all metastasis in the body.

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Figure 1. Metastatic destruction of L2 vertebra.

Metastatic spine disease is not related to the TNM tumor staging, or, in other words, metastasis can appear in all stages of TNM, regardless the life expectancy life expectancy. However, life expectancy is factor which determines our treatment strategy.

For the patient whose general condition is bad and life expectancy is short, complex surgery is risky and unnecessary. In such circumstances, the aim of treatment is reduction of pain, prevention of spine collapse and neuro deficit. We also chose palliative procedures: vertebroplasty/posterior spondylodesis. Therefore, it is very important to analyze general condition of patient, level of pain, neurological status, tumor dissemination and its primary localization, and its pathohistology, and estimate his life expectancy and realize his expectations of our treatment. Quantification of all those factors is performed by Tomita score (Table 1.). Tomita score allows us to calculate patient's life expectancy according his pathohistological diagnosis, general and neurological status, presence of spine and other metastases, with 85% of reliability.

Table 1. Tomita score

Revised Tomita Score - RTS	0 points	1 point	2 points
general condition	weak	mid	good
neurologic cond.	weakness	paresis	normal
meta. in organs	untreatable	treatable	no
meta. in vertebrae	≥3	1-2	no
other bone meta.	≥3	1-2	no
Pathohistology:			
lung, sarcoma, gaster, esophagus, pancreas	0 pts.		
liver, cholecyst	1 point		
Others	2 pts.		
kidney, uterus	3 pts.		
Rectum	4 pts.		
breast, prostate, carcinoid, thyroid	5 pts.		

According to the Revised Tomita Score – RTS we estimate life expectancy and consequently, a recommended treatment (Table 2.).

Table 2. Revised Tomita Score with life expectancy and recommended therapy

RTS points	Life expectancy (months)	Recommended therapy
0-8	0-6	no therapy; radio and chemoth., ev. percut. biopsy, orthosis; palliative th. (vertebroplasty, posterior spondylodesis, ev. decompression)
9-11	7-12	above mentioned th. in more aggressive form
12-15	13 and more	tumor excision (vertebro- or corpectomy, depended of involvement of pedicle; posterior and anterior spondylodesis), ev. adjuvant or neoadjuvant radio/chemotherapy

In treatment of such hard medical conditions, the role of orthopedic surgeon is to provide tumor tissue for pathohistological analysis and operative treatment. Those two tasks can be accomplished as a outpatient in local anesthesia with C arm assistance (percutaneous biopsy of tumor with a concomitant vertebroplasty).⁶

The aim of this work is to present our results of performing this procedure and to describe its importance.

Patients and methods

Including factors were: X ray, CT or MR signs of pathological fracture of thoracic and lumbal vertebra of unknown origin. Twenty-five patients with mentioned criteria were directed to the Spinal department of Clinic for orthopedics and traumatology of Clinical centre University of Sarajevo from October 1st, 2008 to October 1st 2013. During this procedure patient is positioned in abdominal decubitus on the radiolucent surgical table. Operative field is prepared, one C arm is directed horizontally, second one vertically, so that, in each moment, an X ray technician can provide frontal and sagital X ray of targeted vertebra (Figure 2.).

Adherence to anatomical characteristics of each targeted vertebra is of the uppermost importance. Biopsy needle is penetrated into the vertebral body through working channels. Piece of tumor tissue is taken for the pathositological analysis. This procedure is about 10 minutes, long and the only term of its performing is that patient can lay on his stomach during the procedure.

Figure 2. Intraoperative position of canilas through vertebra's pedicule.

Results

Biopsy was performed on 25 patients using the needle biopsy under C arm in local anesthesia. Positive pathohistological proof of tumor was at 21 of them (84%). Other four patients had unrepresentative tissue piece, and we had to repeat the procedure. After pathohistological diagnosis and tumor staging, surgical procedure was necessary only at 8 patients (32%), (Picture 3.) Other 68% of patients had no active spine surgical treatment because metastatic disease with more aggressive histological types advanced (G2). They were only indicated with radio/chemotherapy (low Tomitta score and short *life expectancy*).

Figure.3. Combination of posterior spondylodesis and vertebroplasty of L3 vertebra metastasis.

Discussion

Bone metastases are 25 times more common than primary bone tumors. In clinical practice, bone metastases are detected in one third of patients with malignancy, and even in two thirds on the obductions. For instance, 27% patients with carcinomas have bone metastases, and vertebral bodies are vertebral bodies are parts of the skeleton which are most frequently caught. About 8% of patients with all malignances have spinal metastasis, most common being thoracic spine, about 70%, lumbal spine 20%.⁷

Bearing this in mind, we have to be highly suspicious of oncology patients with back pain - it is considered to be

spine metastasis unless proven different. Maximum suspicion should be given to the presence of others clinical signs of malignoma (weight loss, grey or icteric face habitus, inapetence, long-lasting pain, respiratory, urinary or gastric problems). Concerning the seriosity of tumor diseases and spine fracture it is very important to complete as sooner as possible its TNM-G staging.

So far, a hospitalization of patient with malignancy on the clinic of orthopedics-traumatology, with performance of long lasting staging, including spine biopsy has been common practice. Staging includes further diagnostic procedures: standard and specific laboratory, chest X ray, echo of abdomen, spine CT, and eventually, CT angiography and spine MRI. Sometimes, more than a couple of weeks is needed for this procedure and, during that time, patient's condition becomes worse.

Minimally invasive procedures are the gold standard in all situations where they are feasible with high reliability. Therefore, for the last two decades, percutaneous spine biopsy in local anesthesia under C arm control which does not need classic preoperative patient's preparation has been recommended. This kind of material acquiring for pathohistology allows patients to be directly hospitalized on the Clinic for oncology, where they will get an adequate specialist report and oncological treatment. Involvement of spine (orthopedic-traumatology) surgeon is completed when he provides the material for PH analysis and prescribes an adequate spine orthosis. He can be engaged again if the patient's life expectancy is longer in order to plan and perform the procedure of decompression and stabilization.

Spine metastases at the patients of different age, TNM stage, pathohistology, neurological and general condition are unique therapeutic challenge with high complication rates. If life expectancy is short (3-6 mo.), and our strategy is to prevent further vertebral collapse and perform a biopsy, then vertebroplasty is most suitable. If life expectancy is longer (6-12 mo) the posterior spondylodesis is better. If we face acute neurological deficit caused by metastasis, an urgent local irradiation, which is successful in about 80% of patients. All above mentioned procedures are relatively noninvasive and cause no higher morbidity. If the tumor is recommended solitary and has low level of aggressivity (G0, G1) then it is reasonable to perform more radical surgical procedure, aiming to eradicate a tumor, restaure the stability of spine and achieve a full recovery. Those procedures consist of posterior or anterior vertebral resection with reconstruction with bone cement, polyethylene, metal spacers, endoprotheses, homotransplants, etc.⁸⁻¹³ At hipevascular tumors (kidney and thyroid) it is necessary to perform preoperative embolisation of tumor.^{14, 15}

Conclusion

Despite the presence of many other metastases, spinal metastases are most common symptomatic metastases. Therefore, an orthopedic-spine surgeon is expected to be the leader of consilium, organized for those patients. Percutaneous spine biopsy allows the acceleration of diagnostic procedure and, as soon as possible, the beginning of definite therapy.

References

1. Biscevic M, Hamzaoglu A, Ljuca F, Gavrankapetanovic I, Nadarevic A, Rejec-Smrke B, Smrke D. Minimally invasive surgery at pathological spine fractures – vertebroplasty and kyphoplasty at Department for orthopedics and traumatology in Sarajevo. *Med Arh.* 2009;63(4):234-7.
2. Abrams HL, Spiro R, Goldstein N. Metastases in carcinoma. Analysis of 1000 autopsied cases. *Cancer* 1950; 3:74–85.
3. Malawer MM, Deland TF. Treatment of metastatic cancer to bone. In *Cancer: Principles and Practice of Oncology*, 8th Ed. VT DeVita, S Hellman, SA Rosenberg (eds). Philadelphia: JB Lippincott Co, 1989:2298–2317.
4. Bontoux D, Azais I. Cancer secondaire des os. Clinique et epidemiologie. In *Cancer Secondaire des Os*. D Bontoux, M Alcalay (eds). Paris: Expansion Scientifique Francaise, 1997:19–27.
5. Tubiana-Hulin M. Incidence, prevalence and distribution of bone metastases. *Bone* 1991; 12(Suppl 1):S9–S10.
6. Biscevic M. Modern techniques of treatment of osteoporotic spine fractures – vertebroplasty and kyphoplasty. I.P. “Stamparija Fojnica”, Mar.2011; CIP: 616.711-007.234-001.5-089(075.8)
7. Tatsui H, Onomura T, Morishita S et al. Survival rates of patients with metastatic spinal cancer after scintigraphic detection of abnormal radioactive accumulation. *Spine* 1996; 21(18):2143–2148.
8. Deramond H, Depriester C, Toussaint P. Vertebroplasty and percutaneous interventional radiology in bone metastases: techniques, indications, contra-indications. *Bull Cancer Radiother* 1996; 83(4):277–282.
9. Weill A, Chiras J, Simon JM, et al. Spinal metastases: indications for and results of percutaneous injection of acrylic surgical cement. *Radiology* 1996;199(1):241–247.
10. Cotten A, Dewatre F, Cortet B. Percutaneous vertebroplasty for osteolytic metastases and myeloma: effects of the percentage of lesion filling and the leakage of methyl methacrylate at clinical follow-up. *Radiology* 1996; 200(2):525–530.
11. Shimony JS, Gilula LA, Zeller AJ, Brown DB. Percutaneous vertebroplasty for malignant compression fractures with epidural involvement. *Radiology* 2004; 232(3):846–853.
12. Martin JB, Wetzel SG, Seium Y. Percutaneous vertebroplasty in metastatic disease: transpedicular access and treatment of lysed pedicles. Initial experience. *Radiology* 2003; 229:593–597.
13. Fourney DR, Schomer DF, Nader R, et al. Percutaneous vertebroplasty and kyphoplasty for painful vertebral body fractures in cancer patients. *J Neurosurg Spine* 2003; 98(1):21–30.
14. Gronemeyer DH, Schirp S, Gevarguez A et al. Image-guided radio-frequency ablation of spinal tumors: preliminary experience with an expandable array electrode. *Cancer J* 2002; 8(1):33–39.
15. Picard L, Bracard S, Roland J. Embolization of vertebral hemangioma. Technique-indications-results. Embolisation des hemangiomes vertebraux. Technique- indications- resultats. *Neurochirurgie* 1989; 35(5):289–293.

Perkutana biopsija tumora kičme

APSTRAKT

Mnogi maligniteti u starijoj životnoj dobi se prvo manifestuju patološkim lomom kičme. Obzirom na kompleksnost tumorskih oboljenja i ozbiljnost dijagnoze prijeloma kičme potrebno je što prije završiti stage-ing tumora i odrediti njegov histološki karakter. U ovom radu prikazujemo seriju pacijenata kojima je izvršena perkutana biopsija tumora u lokalnoj. Uključujući faktori su bili RTG, CT ili MR dokazani patološki lom torakalnog ili lumbalnog pršljena nepoznatog porijekla. Kod ukupno 25 pacijenta, iglenom biopsijom pod kontrolom C luka u lokalnoj anesteziji izvršena je biopsija, a kod njih 21 je potvrđen PH nalaz nekog od malignoma (84%). Kod ostalih 4 tkivni uzorak je bio nereprezentativan, i pretraga je morala biti ponovljena. Nakon dobivanja PH nalaza, od pomenutih 25 pacijenata u konačnici, zahvat na kičmi je bio indiciran kod samo 8 pacijenata (32%). Ostali su imali uznapredovalu metastatsku bolest sa agresivnijim tipovima tumora i njima je bila indicirana samo hemo i radioterapija (nizak Tomita score i kratak life expectancy).

Pored brojnih drugih metastaza, najčešća simptomatska metastaza je spinalna. Zbog toga se zahtjeva od ortopeda-traumatologa da preuzme vodstvo konzilija za liječenje ovih pacijenata, koje po prirodi stvari pripada onkologu. Perkutana biopsija tumora kičme omogućuje da se znatno ubrza obrada onkoloških pacijenata i što prije otpočne sa ciljanom onkološkom terapijom.

KLJUČNE RIJEČI:

metastaza, kičma, biopsija, patohistologija, igla