

Role of CT guidance in the biopsy of the spine and paravertebral soft tissue

Tamás Puskás

Department of Radiology, Markusovszky Teaching Hospital, Szombathely, Hungary

CT is the only imaging system which can visualise the vertebral bodies and the adjacent soft tissues at the same time. Contrary to conventional fluoroscopy-guided skeletal biopsy, CT guidance results in more accurate and safer performance of the intervention. Thereby, the complication rate of these procedures can be diminished.

Key words: spinal diseases – radiography; biopsy; computed tomography, x-ray

Introduction

Earlier two-directional radiography and conventional tomography were the only possible imaging modalities in the diseases of the vertebrae. In this way the paravertebral soft tissues could not be identified with safety. Among the modern imaging systems, CT and MR can visualise the vertebrae and the adjacent soft tissues at the same time. Representing the axial plane, CT scans have defined the exact position of the lesion, resulting in better guidance of diagnostic approach.

Materials and methods

The first paper about CT-guided intervention was issued in 1976.¹ From that time on a lot of publications have emphasised the advantages of

CT guidance, and development of interventional procedures.^{2,3} We have performed CT examinations in our hospital by a 3rd generation Siemens Somatom DRH equipment since 1989. The CT-guided intervention was introduced in 1991. The total number of procedures in the last 3 years have amounted to 136, including 16 biopsies in patients affected by diseases of vertebrae and paravertebral soft tissue. We are the first among Hungarian radiologists who have performed CT-guided biopsies in vertebral and paravertebral diseases. For the biopsy of bone structures we use a Jamshidi needle, in case of soft tissue biopsy, it is carried out by a 14 G Uro-cut needle. Before intervention the position and extent of the lesion, and the exact point of biopsy are determined. The patient is in prone position. We use local anaesthesia in adults, a short general anaesthesia is needed in children.

Results

As to the site of 16 interventions we performed the biopsy of soft tissue in 7, and of vertebral

Correspondence to: Tamás Puskás MD, Department of Radiology, Markusovszky Teaching Hospital, Szombathely, Hungary, H-9701.

UDC: 616.711-073.756.8

body in 9 patients. We had to repeat the intervention in 2 patients, because the specimens were not sufficient for histology. In all other cases the first procedure proved to be successful. We present the patients, the types of biopsy and the final diagnosis in Table 1. We marked the repeated biopsies with an asterisk (*).

Case reports

1. A 56-year-old female patient suffered from lumboschialgia. On myelography the contrast material stopped at the level of LIII-IV. The emergent CT examination revealed a large soft tissue mass at the level of LIV, destroying the vertebral arch, and invading to the spinal canal. The CT-guided biopsy verified a metastatic lesion of a malignant thyroid tumour (Figure 1).

2. A 55-year-old female patient was admitted to our hospital because of weight loss and

abdominal pain. In her history an ovarian tumour and a gynaecological surgery were mentioned. Ultrasonography showed a large cystic

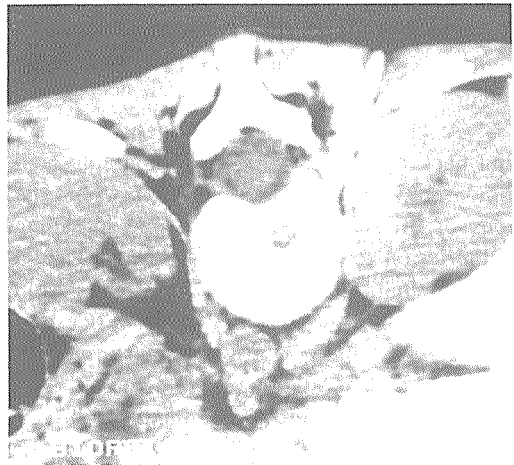


Figure 1. Biopsy of a large soft tissue mass invading the spinal canal at the level of L IV.

Table 1. Types of biopsy and final diagnosis.

Number	sex	age	Site of biopsy	Result
1	F	50	body of LIV	unsuccessful
2	F	56	paravertebral soft tissue	metastatic thyroid tumour
3*	F	50	body of LIV	tuberculous inflammation
4	M	45	body of LII	metastatic testicular tumour
5	F	57	body of LIV	metastatic breast tumour
6	M	53	paravertebral soft tissue	sarcoma
7	F	81	paravertebral soft tissue	unsuccessful
8*	F	81	paravertebral soft tissue	inflammation-abscess
9	F	55	paravertebral soft tissue	metastatic ovarian tumour
10	F	11	body of ThXII	tuberculous inflammation
11	F	54	body of ThX	metastatic breast tumour
12	M	45	paravertebral soft tissue	metastatic testicular tumour
13	M	72	body of CVII	metastatic colon tumour
14	F	64	body of LI	metastatic lung tumour
15	M	38	body of ThXI	tuberculous inflammation
16	M	71	paravertebral soft tissue	metastatic pancreas tumour

lesion at the upper margin of the iliac bone. A CT examination followed to define the origin and the exact localisation of the cystic mass. A retroperitoneal lesion was seen, partially destroying the body of LV. A CT-guided aspiration was performed. The cells of the obtained fluid proved to be in stage IV Papanicolau (Figure 2).

3. A 11-year-old girl complained of increasing back pain. Conventional radiography and tomography showed lytic destruction within the body of LI. Because of the possible spreading of the lesion towards the intervertebral disc, a CT examination was carried out. The lesion was only inside the vertebral body. A CT-guided vertebral body biopsy was performed in short general anaesthesia. Histology confirmed the diagnosis of tuberculous inflammation. (Figure 3).

Discussion

Robertson and Ball presented the first publication on needle biopsy of spine in 1935.⁴ At the beginning the procedure was carried out by the help of fluoroscopy, later by image intensifier.^{5,6} To avoid pleural damage in case of thoracic region biopsy, the needle was placed 6cm from processus spinosus and inserted in angle of 60 degree towards the vertebral body. With biopsy of a lumbar vertebra, the distance of needle insertion from the processus spinosus was 8cm, and the angle was 45 degree. During the procedure the position of the needle was checked from a-p and lateral projections. The other technical possibility of fluoroscopy guided biopsy was achieved by approaching the vertebral body through the pedicle. By representing the axial plane, CT examination have made easier planning and performing of vertebral biopsies.^{7,8,9} The use of CT as a primary or subsidiary technique for biopsy is a personal decision eventually modified by the availability of the imaging equipment. One of the less accessible regions for fluoroscopy-guided biopsy is the upper thoracic spine. Except for the very

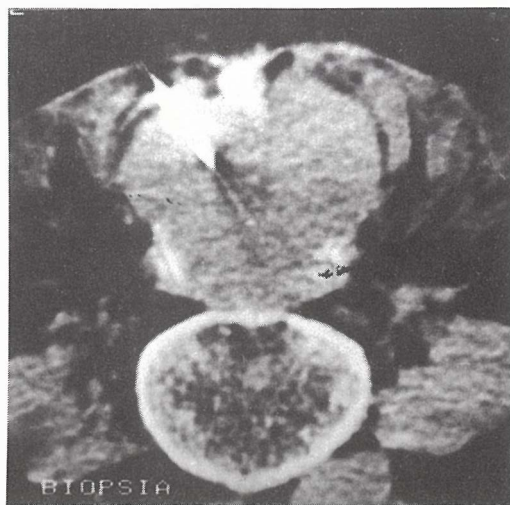


Figure 2. Aspiration of a retroperitoneal cyst destroying the body of L V.

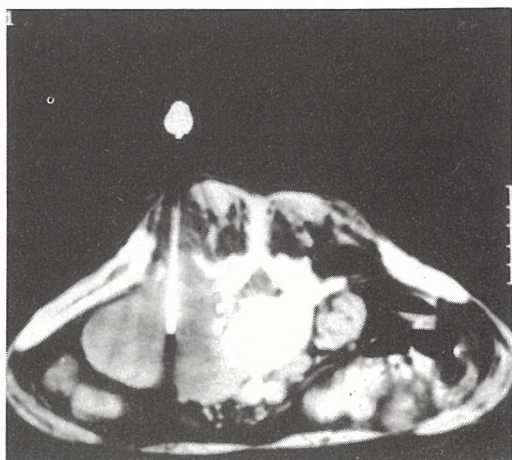


Figure 3. Biopsy of a lytic lesion in the body of L I.

experienced operator, only CT control of the needle is safe in this region.¹⁰

Because of the weak contrast capacity of fluoroscopy the abnormal paravertebral soft tissues could not be visualised. In case of a paravertebral malignant soft tissue lesion its extent, position, and density can be exactly defined by CT. The shortest way to the target must be chosen. In a large mass with a necrotic centre, it is suitable to perform the biopsy from its edge.

As for the complications, Stocker reported a 2,2% rate in his series. Our patients complained of only temporary back pain.¹¹

In agreement with other authors, we conclude that CT guidance in interventions on the spine and paravertebral soft tissue is a safe and exact technique. The only disadvantage is that dynamic imaging during needle insertion is not possible.

References

1. Haaga JR, Alfidi RJ. Precise biopsy localization by computed tomography. *Radiology* 1976; **118**: 603-7.
2. Grönemeyer DHW, Seibel RMM. Interventionelle Computertomographie. Ueberreuter Wissenschafts Verlag Wien, Berlin 1989.
3. Haaga JR, Alfidi RJ. Computed tomography of the whole body. St. Louis, 1983 The CV Mosby Co.
4. Robertson RC, Ball RP. Destructive spine lesions. Diagnosis by needle biopsy. *J Bone Joint Surg /Am/* 1935; **17**: 749-58.
5. Craig FS. Vertebral body biopsy. *J Bone Joint Surg /Am/* 1956; **1**: 38-A.
6. Valls J, Ottolenghi CE, Schajowicz F. Aspiration biopsy in diagnosis of lesions of vertebral bodies. *JAMA* 1948; **136**: 376-82.
7. Adapon BD, Legada BD, Lim EVA, Silao JV, Dalmacio-Cruz A. CT-guided biopsy of the spine. *J Comput Assist Tomogr* 1981; **5**: 73-8.
8. Frager DH, Goldman MJ, Seimon LP. Computed tomography guidance for skeletal biopsy. *Skeletal Radiol* 1987; **16**: 644-6.
9. Renfrew DL, Whitten CG, Wiese JA, El-Khoury GY, Harris KG. CT-guided percutaneous transpedicular biopsy of the spine. *Radiology* 1991; **180**: 574-6.
10. Stocker DJ. Bone biopsy. *Skeletal Radiology Merit Communications Nicer Series on Diagnostic Imaging* 1991.
11. Stocker DJ, Kissin CM. Percutaneous vertebral biopsy: review of 135 cases. *Clin Radiol* 1985; **36**: 569-77.