Acta orthop. scand. 44, 372–382, 1973

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TUMOUR, TUBERCULOSIS AND OSTEOMYELITIS OF THE SPINE

Differential Diagnostic Aspects

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Accepted 23.i.73

It is well known that the differential diagnosis between tumour, tuberculosis and unspecific osteomyelitis of the spine may be difficult, as the symptoms and signs are very much alike. This has been discussed by so many authors that there is no point in trying to give a complete list of the literature. From this hospital Nissen-Lie (1941) and Alvik (1951) have already discussed the problem.

As the possibilities to treat these diseases improve, the desirability to establish a correct diagnosis increases. To get an impression of the differential diagnostic values of different clinical, laboratory and radiological findings, the author has reviewed records and X-rays of 150 patients with spinal disease, viz. 50 with tumour, 50 with tuberculosis and 50 with unspecific osteomyelitis.

MATERIAL AND METHODS

43 of the patients with tumour had their diagnosis verified by histological examination following a biopsy of the tumour or following an autopsy, and in 7 cases by histological examination of a primary tumour or metastases to lymph nodes. Patients with probable hemangioma of the spine are excluded as the diagnosis was made radiologically only and not verified by histology. The types of tumours were:

Cancer metastases in	23 cases
Malignant mesenchymal tumour	8 „
Myelomatosis	4 „
Plasmocytoma	4 „
Reticulosarcoma	3 „
Ewings sarcoma	2 „
Lymphogranulomatosis	2 „
Histiocytosis (eosinophilic granuloma)	1 „
Melanoma	1 „
Chondroma	1 „
Aneurysmal bone cyst	1 „
	50 „

The patients are reviewed as one single entity as they are too few in each category to be evaluated in different groups according to type of tumour.

Included among the tuberculous patients are only those where the diagnosis was verified by the demonstration of TB in pus or granulation tissue and/or by histological examination. Patients with palpable abscess or draining sinus are excluded as these patients do not represent the diagnostic problem under discussion.

In the group of osteomyelitis are included 29 patients where the microorganism was demonstrated (Staph. aureus in 28 of these cases) and 5 where histology was compatible with unspecific osteomyelitis. In the remaining 16 cases the diagnosis was made ex juvantibus and later good health. Six of these last cases had, in addition, elevated ASTA.

RESULTS

Sex and age distribution in the three groups were:

	Total	Tumour	Tub.	Osteo.
Males	87	31	24	32
Females	63	19	26	18
	150	50	50	50
0–14 years	14	4	1	9
15–29 „	10	3	3	4
30–44 „	35	12	18	5
45–59 „	53	17	16	20
60 or more	38	14	12	12
	150	50	50	50

History and Clinical Findings

The duration of the present history before the patient consulted a doctor cannot be estimated from the records, but the duration before admission to hospital was:

	Total	Tumour	Tub.	Osteo.
Less than 3 months	51	7	5	39
3– 6 „	29	16	6	7
6–12 „	38	17	18	3
More than 12 „	32	10	21	1
	150	50	50	50

Acute onset of symptoms was reported in 38 patients with osteomyelitis and in only a few patients in the other two groups. Usually the first symptom was back pain, but in 22 cases the initial symptom was fever followed by chills and temperatures of 39–40°C. All of these last patients had osteomyelitis.

Back pain, stiffness of the back, pain with toe-heel fall, as well as tenderness were usual complaints in all three groups, but were not always present. Fever before or at admission was found in:

Total	Tumour	Tub.	Osteo.
43	8	13	22

Previous tuberculosis or tuberculosis in other organs at the same time as the spinal disease under discussion was found:

Total	Tumour	Tub.	Osteo.
42	13	24	5

Paraplegia occurred within 3 months of the first symptoms of the spinal disease, or later:

	Total	Tumour	Tub.	Osteo.
Within 3 months	5	4	–	1
Later	15	8	7	–
	20	12	7	1

Laboratory Findings:

Hemoglobin per cent	Total	Tumour	Tub.	Osteo.
90 or more	77	24	35	18
80–89	43	10	12	21
70–79	23	11	3	9
Less than 70	6	4	–	2
Not registered	1	1	–	–
	150	50	50	50
ESR in mm/hour				
1–10	10	5	5	–
11–19	18	7	10	1
20–49	51	16	29	6
50–69	23	11	3	9
70–99	23	9	3	11
100 or more	25	2	–	23
	150	50	50	50
Tuberculin reaction positive	125	40	50	35
Pos. in age 0–14 years	8	2	1	5

Phosphatase examination was done in proportionately too few patients to be reported.

Radiological Findings

Two lesions were found in 6 patients with tumour and 2 with osteomyelitis, but only the one which dominated clinically and radiologically is tabulated below.

The regions of spine involved were:

	Total	Tumour	Tub.	Osteo.
Cervical spine	2	2	–	–
Thoracic „	84	27	26	31
Lumbar „	64	21	24	19
	150	50	50	50

The dorsolumbar junction is here regarded as the thoracic region.

The number of vertebrae involved were:

	Total	Tumour	Tub.	Osteo.
1 vertebra	35	23	5	7
2 „	93	17	34	42
3–4 „	16	7	8	1
5 or more „	6	3	3	–
	150	50	50	50

The radiological findings, tabulated according to the ABC of reading spinal X-rays were:

	Total	Tumour	Tub.	Osteo.
Axis – change of	90	21	35	34
Bulging of paraspinal soft tissue shadows	83	23	31	29
Corpus				
height reduction	96	30	38	28
margin erosion	140	46	47	47
structural changes	125	50	48	27
Disc reduction	136	40	48	48
Pedicle involvement	50	31	8	11

Any deviation from the usual is recorded here as change of axis. Bulging of the paraspinal soft tissue shadows includes slight and unilateral bulging, which was seen:

	Total	Tumour	Tub.	Osteo.
Unilateral or definitely asymmetrical bilateral	53	15	22	16
Bilateral symmetrical	30	8	9	13
	83	23	31	29

Disc reduction can include the total disc or part of it. Structural changes in the vertebral arch can be seen in antero-posterior as well as lateral views and are often easier to discover in the antero-posterior ones.

The number of patients where all the mentioned X-ray findings were present, compared to those with the same findings except pedicle involvement, were:

	Total	Tumour	Tub.	Osteo.
All findings present	14	3	6	5
All findings except pedicle involvement	24	1	21	2

Special Examinations

Aspiration of bulging paravertebral soft tissue shadows was often done, but not always, e.g. not in cases which were judged to be overwhelmingly probably tuberculous and radical operation was planned.

Needle aspiration of the vertebrae was done in only a few cases. Open, surgical biopsy of the diseased vertebrae was performed in 91 patients.

DISCUSSION

Only those symptoms and signs will be discussed which may be or have been reported to be of differential diagnostic value.

Age between 0–14 years means some probability of osteomyelitis, in this study 9 of 14 patients, and very little probability of tuberculosis. This demonstrates how bone and joint tuberculosis is no longer a disease of childhood in Norway. Patients 60 years old or more were equally distributed in all three diagnostic groups.

History of shorter duration than three months before admission to hospital indicates osteomyelitis. This is just another way of saying that the symptoms from osteomyelitis are pronounced and develop rapidly (Nissen-Lie 1941, Alvik 1951, Mach 1968). A history of more than 12 months suggests tuberculosis.

Acute onset of symptoms indicates osteomyelitis and especially if it takes the form of fever with chills and temperatures of 39–40°C.

The reviewed records do not tell whether it is typical for tumour that the back pain does not reduce following immobilisation (Bette 1955, Taubert 1958, Mach 1968, Brocher 1970).

Previous tuberculosis or tuberculosis in other places at the same time must not exclude from the mind the possibility of tumour or osteomyelitis. In this study two of the tumour patients had a metastasis located to previously verified tuberculous vertebrae, three had bacillary lung tuberculosis and one had bacteriologically verified hip tuberculosis at the same time as their spinal tumour.

Paraplegia is said to indicate tumour and particularly if it is early (Bette 1955). This study supports the assertion to a slight degree only. Paraplegia seems seldom to be due to osteomyelitis.

Hemoglobin per cent below 80 strongly contradicts a diagnosis of tuberculosis.

ESR 1–10 mm/hour can be seen in patients with tumour and tuberculosis, but not osteomyelitis where it is seldom seen below 50 mm. According to Brocher (1970) one-third of patients with tuberculosis of the spine never have elevated ESR. The six patients in this study with spinal tuberculosis and ESR of more than 50 mm had the following complications: lung tuberculosis and empyema, pleuritis, Addison's disease, kidney tuberculosis, paraplegia, pyuria of unknown character. In another group of 100 patients with tuberculosis of the spine, the author found that 19 out of 20 patients with ESR 50 mm or more all had complications in the form of tuberculosis of other organs, paraplegia or open sinus (Paus 1964). It seems justified to assert that ESR 50 mm or more contradicts the diagnosis of tuberculosis of the spine if there is no complication or other concomitant disease.

ESR 100 mm or more, in uncomplicated cases, practically proves the diagnosis of osteomyelitis.

Positive tuberculin reaction was found in all the tuberculous patients in this study, but can be negative (Paus 1964). The sole differential diagnostic indication the test can give is perhaps that negative reaction in age group 0–14 years excludes tuberculosis or makes it highly improbable. Positive reaction even in this age group was seen in all groups.

Schinz (1966) found that osteomyelitis most often affects the lumbar region. This was not the case in this study.

Schmorl & Junghans (1968) maintain that in case of metastatic tumour there are usually multiple lesions. This was not the case in this study. It should be regarded as accidental circumstance that none of the tuberculous patients in this study had more than one lesion.

One single vertebra involved indicates a likelihood of tumour, while involvement of two vertebrae indicates tuberculosis or osteomyelitis. If three or more vertebrae are involved, the diagnosis osteomyelitis is unlikely to be correct as earlier described (Nissen-Lie 1941, Murray & Jacobson 1971).

Bulging of paraspinal soft tissue shadow, unilateral or bilateral, was evenly distributed in all three groups, which was also Mach's (1968) observation, whereas Bette (1955), Taubert (1958) and Brocher (1970)

assert that lacking or unilateral bulging indicate tumour. Murray & Jacobson (1971) found the bulging larger in cases of tuberculosis than tumour and osteomyelitis. As the bulging can be seen without representing an abscess, the commonly used expression "abscess" shadow should be banned as a misnomer.

Structural changes in the vertebral body indicate tumour or tuberculosis in this study, as also reported by Bette (1955).

It is usually stated that the intervertebral disc retains its height in cases of tumour contrary to infectious cases (Bette 1955, Taubert 1958, Edeiken & Hodes 1967, Köhler 1967, Murray & Jacobson 1971). This study does not support this view as 40 out of 50 patients with tumour had reduced disc height. But if the disc has retained its height, *this* is an indication for tumour, as was found in this study in 10 out of 14 patients. Mach (1968) also regards this as almost a differential diagnostic proof.

Pedicle involvement seems to represent a probability of tumour as also described by Mach (1968) and Brocher (1970). This study neither supports the assertion that osteomyelitis affects the arch more often than tuberculosis (Brocher 1968, Schmorl & Junghans 1968) nor the assertion that arches are more usually affected than vertebral body in osteomyelitis (Schinz 1966).

All the mentioned X-ray findings could be found at the same time in all three groups, but seldom. However, if all X-ray findings were present except pedicle involvement, this seemed to indicate tuberculosis. The only patient with tumour with such findings had myeloma. This confirms Brocher's (1970) assertion that myeloma has no predilection for the arch in contrast to other tumours.

It continues to be impossible to establish a firm diagnosis clinically. It is mandatory to get a specimen for histological and bacteriological examination. This is also the only way to find out the type of tumour or bacteria and its sensitivity to chemotherapy. If there is bulging soft tissue shadows, an aspiration can be tried. If not, only open operation or needle aspiration biopsy remain.

Operation with biopsy is recommended by Johnson et al. (1953), Nagel (1965), Mach (1968) and Brocher (1970); Lichtenstein (1965) will "resort to" needle biopsy only if biopsy at surgery for some reason cannot be performed. In contrast, Coley (1960) advocates aspiration biopsy and Ottolenghi (1969) has developed the needle aspiration technique so he can use it in all regions of the spine and with convincing results.

The risk is minimal by both methods. In favour of the open method it can be said that in cases of tuberculosis the surgical treatment can be done at the same time as the biopsy. Also in cases of osteomyelitis it may be of therapeutic value to open. In favour of aspiration biopsy it can be said that the procedure is smaller and the patient is spared the postoperative unpleasantness which is admittedly present, even if it is usually not serious.

Scintimetry with ^{85}Sr (Felländer & Lindberg 1966, Fassbender et al. 1969, Defiore et al. 1970) reportedly give a possibility for early diagnosis of tumour, tuberculosis and osteomyelitis of the spine as well as information as to the extent of the lesion. But it does not give the differential diagnosis, let alone the type of tumour or bacteria and its sensitivity to chemotherapy.

CONCLUSIONS

The differential diagnosis between tumour, tuberculosis and osteomyelitis of the spine is often difficult to establish on the basis of clinical, laboratory and radiological findings alone. None are pathognomonic for one or the other disease, and none are always present.

Tumour is somewhat probable if only one single vertebra is involved and if the X-rays demonstrate the disc height retained or the pedicle involved.

Tuberculosis is probable if the history exceeds twelve months and is strongly indicated if all the above-mentioned X-ray findings except pedicle involvement are present. An age of 0–14 years contraindicates tuberculosis, particularly if the tuberculin test is negative, as do hemaglobin per cent below 80 and ESR 50 mm or more in uncomplicated cases.

Osteomyelitis is practically certain if the onset is acute and particularly with chills and temperature of 39–40°C, and if ESR is 100 mm or more. It is probable if the history is shorter than three months, and if the patient is 0–14 years old. Contraindicating osteomyelitis are paraplegia, ESR below 50 mm, and if X-rays show three or more vertebrae involved.

To establish a definite diagnosis and also to find out which type of tumour or bacteria is present and its sensitivity to chemotherapy, operation with exposure of the lesion is recommended, possibly needle aspiration biopsy.

SUMMARY

Records and X-rays of 50 patients with tumour, 50 with tuberculosis and 50 with unspecific osteomyelitis of the spine have been reviewed. The clinical, laboratory and radiological findings are evaluated with regard to their differential diagnostic value.

Some few may practically prove a diagnosis while others, at the most, justify a suspicion or a probability. No finding was found pathognomic or required.

To establish a firm diagnosis as well as to make out which type of tumour or bacteria is present and its sensitivity to chemotherapy, operation and open biopsy of the spinal lesion are recommended.

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