European **Rev**iew for **Med**ical and **Pharmacol**ogical **Sci**ences 2008; 12: 155-160

Spinal metastasis: a retrospective study validating the treatment algorithm

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Abstract. – A retrospective clinical study was conducted to validating the treatment algorithm in patients with spinal metastasis. The study participants were 43 patients with spinal metastasis from carcinoma. Since most interventions are palliative we had to seek for clear definitions to describe the results, aiming to increase the quality of life. To this purpose, we would introduce the concept of "target achievement". We presume that the target is achieved when all the following findings are present: a survival rate which is not inferior to the average, improvement or the maintenance of the neurological condition and achievement of local control.

The results of this study demonstrate that performing the treatment suggested by the algorithm, the majority of the patients have a good residual quality of life. Worse results are obtained when a more aggressive treatment is selected.

Key Words:

Spinal metastasis, Quality of life, Multidisciplinary treatment

Introduction

The incidence of vertebral metastasis is steadily increasing in time. The literature describes a percentage as high as 10% of the patients who are diagnosed with having a primary carcinoma develops a symptomatic vertebral metastasis in time[1]. It is of crucial importance for the patient that the best available treatment for his or her situation is chosen. The "best treatment" should include local control of the disease and recovery of spine functions: stability, mobility, neurological structures protection. The target should be the best quality of life. Multidisciplinary treatment could be beneficial. Failure to do this is very likely to end in a suboptimum prognosis and could even lead to severe impairment.

There are no generally accepted guidelines whatsoever in the literature concerning the need to treat a patient with symptomatic vertebral metastasis, nor is it clear which guidelines in treatment are the best to follow[2]. A problem is the difficulty of characterizing the most appropriate treatment for each patient individually through a sequential process that not only takes into account the general conditions of the patient but also the prognosis and other several parameters of the metastatic disease. Because we were not completely satisfied with some guidelines proposed in the literature, excellent tool for retrospective study but absolutely impractical in daily work, we started to think, in the beginning of 2002, about how to build an optimal guideline for those patients suffering from vertebral metastasis. We developed a flow-chart which we used to guide us in choosing a treatment suitable for each individual patient and to involve other non surgical physicians (anaesthetist, oncologist, radiotherapist) in the surgical decision making process[3]. In this study we try to validate our flow chart.

Validating the effectiveness of our flow-chart is not an easy task. Because most interventions are palliative we had to seek for clear definitions to describe the results, aiming to increase the quality of life.

To this purpose, we would introduce the concept of "*target achievement*". We presume that the target is achieved when all the following findings are present:

– a survival rate which is not inferior to the average, calculated on epidemiological data for each histotypes;

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– improvement or the maintenance of the neurological condition;
– achievement of local control, absence of local recurrences and no increase of tumor size.

Materials and Methods

For this study we have retrospectively reviewed forty-three patients. All patients had histological diagnosis of spine metastasis from carcinoma. We excluded patients suffering from systemic diseases (plasmacytoma, lymphoma, etc) and those patients suffering from metastasis from sarcoma.

The series consists of 20 male patients and 23 female patients, age ranging 32 to 81 years (mean 56,2) (Table I).

We used the flow-chart (Figure 1) to propose treatment and submitted the actually chosen treatment (which sometimes differed from the proposed one as explained later) to a thorough investigation to exam the results. We used the anaesthesiological score (ASA) to determine the operability of the patients. Patients who scored a 4 or higher were not considered for surgery. The risk of developing a pathological fracture in time was determined following the outline proposed by Taneichi et al.[4]. They predict a very high risk of a pathological fracture in a vertebral body showing 60% osteolysis, involvement of the costovertebral joint in the thoracic spine and involvement of a pedicle in the lumbar spine.

The most difficult parameter to determine is probably the sensitivity to adjuvant therapy. Except, of course, for those patients presenting with a progression of the disease during radiotherapy and/or chemotherapy, it is always difficult to predict the contribution and thus sensitivity of adjuvant therapy in different histological subtypes. Also because of the continuously increase of knowledge on this matter and the development of new drug experiments.

Today we can predict, relatively accurate, the response of patients to adjuvant therapy, suffering from metastasis originating from the breast, lung, uterus, thyroid gland, prostate and bladder. Within these main categories there are subgroups who can behave in different ways, like for instance small cell carcinomas and non-small cell carcinomas of the lung.

Results

In 60% of cases (26 of 43), the treatment performed was the same as proposed by the flow-chart. In these 26 cases, we achieved the target in 20 cases (77%), while in the remaining 6 cases (23%) we did not.

In 40% of cases (17 of 43) the algorithm was not followed, usually to prevent overtreatment (in 14 cases). In those patients where we didn't follow the algorithm we achieved the target in 41% of cases. This percentage drops to 36% when we consider only the patients who underwent "overtreatment". In three patients the algorithm wasn't followed because of a "undertreatment", and in these cases the percentage of target achievement was 67% (Table II).

Discussion

In the past few years, the concept of scoring spine metastases has evolved in systems proposing treatment on a simple mathematical sum calculated by several parameters, without a patient-centered approach[5-7]. For instance, in our opinion it is useless to estimate the risk of developing a pathological fracture in a non-operable patient. Moreover, the result is almost always estimated only on survival rate. The life expectancy is very difficult to calculate preoperatively, and the survival rate can also be influenced by the clinical status of the patient, whose a prolonged hospital course, required by the presence of pathological fractures and/or neurological impairment, can increase the probability of cardio-circulatory or respiratory complications that can result in death[8]. Moreover, there are only few important data supporting the residual quality of life in these patients. Often, the only parameter available and taken into consideration, is the pain, without considering ability to walk, neither the occurrence of a local recurrence or the progression of the disease. These elements negatively affect the quality of life.

In the concept of "target achievement" the local control of the disease is central. A local recurrence has dramatic effects for the patient resulting in pain and possibly neurological impairment and mechanical failure. In these cases further surgery is almost always necessary to perform a second surgical intervention with obvious discomfort for the patient and further morbidity.

Analysing the results of this retrospective study, we can realize that discrepancy between

Table I. Causes included in the retrospective study.

Patient	Operability	RXT-CHT- Hormonal Immuno sensitivity	Spinal compression with motor imp.or paralysis	Possibility of recovery	Increasing damage	Pathologic fracture	Isolated metastasis	Therapeutic possib. in osseous and/or visceral mets	Algorithm output	Treatment	Algorithm correspondence	Results	Follow-up (months)	Local control	Frankel Score
1	Y	N	N	–	–	–	N	N	Pain Therapy	Dec Stab	N	Dead	2.9	Y	W
2	Y	Y	N	–	–	Y	–	–	Decompression Stab	Curettage	N	Dead	4	Y	U
3	Y	–	Y	Y	Y	–	–	–	Emergency	Dec Stab	Y	Dead	21.3	Y	I
4	Y	N	N	–	–	–	Y	–	Excision (Dblk, Resect)	Curettage	Y	Dead	6	Y	U
5	Y	N	N	–	–	–	Y	–	Excision (Dblk, Resect)	Dec Stab	N	Dead	7.5	Y	U
6	Y	Y	N	–	–	Y	–	–	Decompression Stab	Curettage	N	Dead	18.3	N	U
7	Y	N	N	–	–	–	Y	–	Excision (Dblk, Resect)	En Bloc	Y	Dead	29.7	Y	W
8	Y	–	Y	Y	Y	–	–	–	Emergency	Dec Stab	Y	NED	55.5	Y	I
9	Y	N	N	–	–	–	N	N	Pain Therapy	Dec Stab	N	Dead	2.4	N	W
10	Y	N	N	–	–	–	N	Y	Excision (Dblk, Resect)	Dec Stab	N	Dead	12.7	Y	U
11	Y	Y	N	–	–	Y	–	–	Decompression Stab	Curettage	N	Dead	5.1	Y	W
12	Y	Y	N	–	–	N	–	–	Cht–Rxt Hormonal Treat	Curettage	N	Dead	9.4	Y	U
13	Y	–	Y	Y	Y	–	–	–	Emergency	Curettage	Y	Dead	6.7	Y	W
14	Y	N	Y	Y	Y	–	–	–	Emergency	Dec Stab	Y	Dead	5.1	Y	I
15	Y	–	Y	Y	Y	–	–	–	Emergency	Curettage	Y	Dead	2.1	Y	I
16	Y	–	Y	Y	Y	–	–	–	Emergency	Dec Stab	Y	Dead	5.8	Y	U
17	Y	Y	N	–	–	N	–	–	Cht–Rxt Hormonal Treat	RT	Y	Dead	1	N	W
18	Y	Y	N	–	–	N	–	–	Cht–Rxt Hormonal Treat	En Bloc	N	NED	39.5	Y	U
19	Y	N	N	–	–	–	N	N	Pain Therapy	Pain Therapy	Y	Dead	16.7	Y	U
20	Y	Y	N	–	–	N	–	–	Cht–Rxt Hormonal Treat	RT	Y	Dead	3.6	N	W
21	Y	Y	N	–	–	Y	–	–	Decompression Stab	Curettage	N	Dead	9.3	Y	U
22	Y	N	N	–	–	–	Y	–	Excision (Dblk, Resect)	En Bloc	Y	Dead	10.5	Y	W
23	Y	Y	Y	Y	Y	–	–	–	Emergency	Curettage	Y	NED	71.5	Y	I
24	Y	–	Y	Y	Y	–	–	–	Emergency	Dec Stab	Y	AWD	60.6	Y	I
25	Y	Y	N	–	–	Y	–	–	Decompression Stab	Curettage	N	AWD	42.8	Y	U
26	Y	N	N	–	–	–	Y	–	Excision (Dblk, Resect)	Dec Stab	N	Dead	5.2	Y	W
27	Y	N	N	–	–	–	N	Y	Excision (Dblk, Resect)	Curettage	Y	Dead	38.2	N	W
28	Y	N	N	–	–	–	Y	–	Excision (Dblk, Resect)	Curettage	Y	Dead	11	N	U
29	Y	–	Y	Y	Y	–	–	–	Emergency	Curettage	Y	Dead	9	Y	W
30	Y	N	N	–	–	–	N	Y	Excision (Dblk, Resect)	En Bloc	Y	AWD	50.7	Y	U
31	Y	Y	N	–	–	N	–	–	Cht–Rxt Hormonal Treat	Curettage	N	Dead	32	N	U
32	Y	–	Y	Y	Y	–	–	–	Emergency	Dec Stab	Y	Dead	0.8	Y	U
33	Y	–	Y	Y	Y	–	–	–	Emergency	Curettage	Y	Dead	0.1	Y	W
34	Y	–	Y	Y	Y	–	–	–	Emergency	Curettage	Y	AWD	60.4	N	I
35	Y	–	Y	Y	Y	–	–	–	Emergency	Curettage	Y	AWD	50.8	Y	I
36	Y	N	N	–	–	–	Y	–	Excision (Dblk, Resect)	En Bloc	Y	AWD	49.1	Y	U
37	Y	N	Y	Y	N	–	N	N	Pain Therapy	En Bloc	N	Dead	11.6	Y	W
38	Y	Y	N	–	–	N	–	–	Cht–Rxt Hormonal Treat	Dec Stab	N	AWD	32.1	Y	U
39	Y	Y	N	–	–	N	–	–	Cht–Rxt Hormonal Treat	Curettage	N	NED	39.4	Y	U
40	Y	–	Y	Y	Y	–	–	–	Emergency	Curettage	Y	AWD	30.3	Y	I
41	N	N	–	–	–	–	–	–	Pain Therapy	Pain Therapy	Y	Dead	5.1	N	W
42	Y	N	N	–	–	–	N	N	Pain Therapy	En Bloc	N	Dead	9.7	Y	U
43	Y	N	N	–	–	–	N	Y	Excision (Dblk, Resect)	Curettage	Y	NED	41.5	N	U

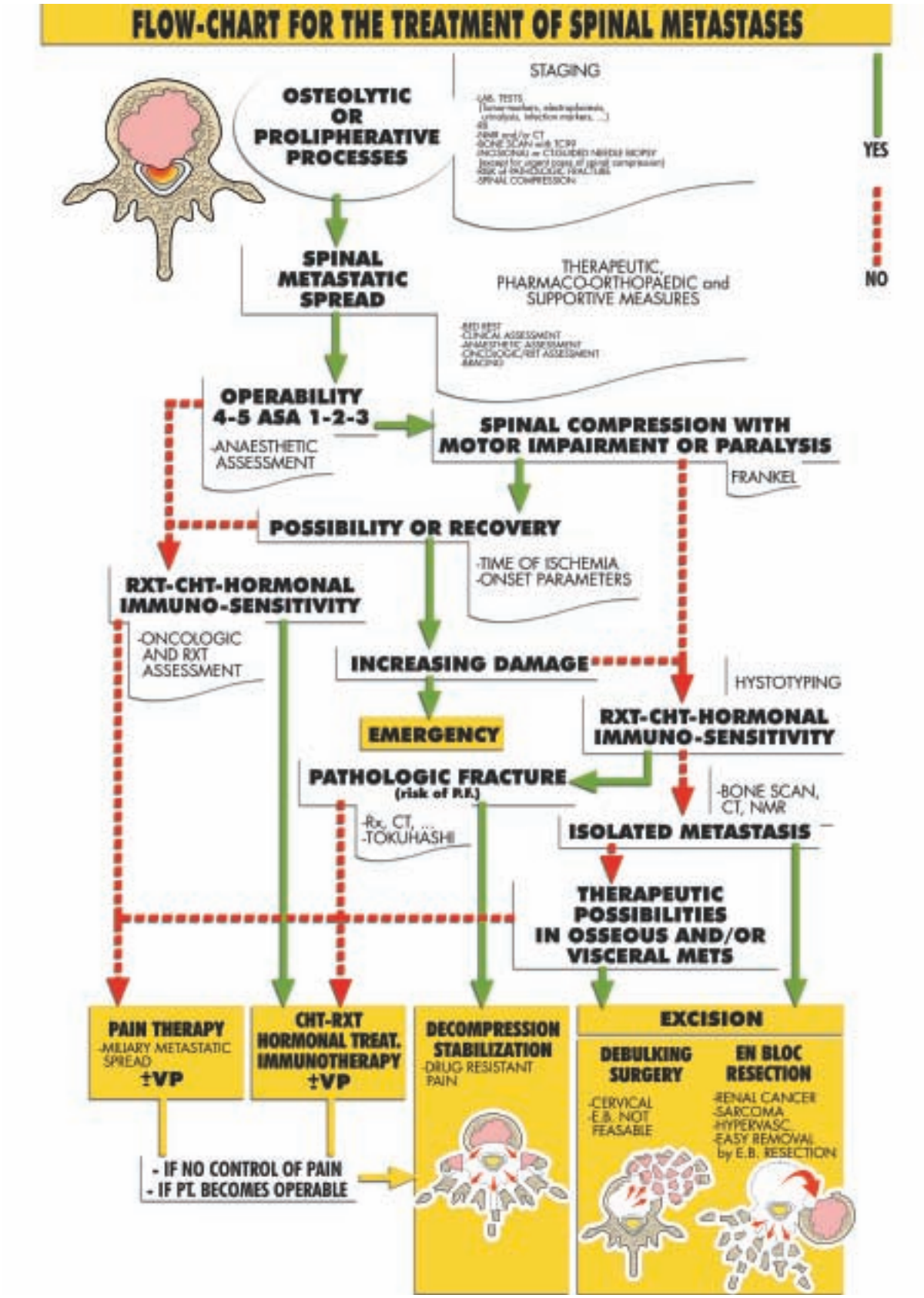

Figure 1. Spinal metastasis treatment algorithm.

Table II. Results.

Treatment	%	% of target achievement
According to the algorithm	60%	77%
Discrepancy to the algorithm	40%	41%
– Overtreatment	82%	36%

treatments is almost always caused by an overtreatment (9 of 14 cases).

The number of patients in whom the target was achieved is directly proportional to those treated according to the algorithm, while the best results in those treated differently were achieved when undertreated. This data is not statistically significant. However, we can recommend that in the more doubtful cases, it is preferred to decide a less aggressive approach.

In 6 patients treated according to the algorithm, the results were disappointing. In one case we performed an en bloc resection, but the patient survived less than one year with worsening of the neurological condition because of an other metastasis also located in the spine. In two cases we performed a curettage without achieving the local control of the disease. In these cases the algorithm suggested an excisional procedure. The choice, whether to perform en bloc resection or intralesional excision, must be made upon other factors like ΔT (which is the time between the treatment of the primary tumor and the occurrence of a metastasis), exceeding vascularity of the lesion or the feasibility of the procedure. An en bloc resection provides the best local control[9], while there is still no evidence that this procedure can reduce the immunocompetence of the patient with a consequent progression of the disease, as suggested by some Authors.

Recently, we have demonstrated that in high vascularity tumors, like the metastases from renal carcinoma, en bloc resection, notwithstanding the longer surgical time and exposure to anaesthetics, results in a better intraoperative stability of the hemodynamics parameters and a minor blood loss, compared to intralesional excision[10]. En bloc resection is not always technically possible in the cervical spine; conversely, in the thoracic spine, it is often possible to perform en bloc resection with a single posterior approach[11].

In the other three cases, a curettage was performed in emergency due to increasing deterioration of neurological status. In these cases, a circumferential decompression was performed with partial debulking[11]. The target was not achieved in 2 cases as the survival was less than 2 months In the third case, the local control was not achieved but thee neurological status improved and the patient is still living after 5 years with good quality of life.

Conclusion

Many score based systems can be found in the literature, which are based on the presumed ability to predict the survival of patients with vertebral metastases. The flow-chart we are daily following is patient-centered and multidisciplinary. Every specialist involved must take notice of the latest specific knowledge on the matter, so that the flow-chart will be in continuous development and will always be up-to-date with the most recent innovations.

The results of this retrospective study demonstrates that performing the treatment suggested by the algorithm, the majority of the patients have a good residual quality of life. Worse results are obtained when a more aggressive treatment is selected.

Two points are still a serious matter of discussion in criticizing the proposed algorithm. First, in those situations where an urgent procedure is required in order to prevent neurological worsening. When performed before full motor paralysis, decompression and stabilization (including some debulking) mostly results in immediate improved Frankel score but the progression of the disease in the cases not responding to adjuvant therapy could result in early recurrence of symptoms. Maybe it would be an improvement to take also into consideration the level of urgency derived from the histology of the primary tumor in reference to a more or less complete response on adjuvant therapy.

The second point of criticism concerns the decision of performing intra- or extralesional excision in when the flow-chart suggest an excisional procedure. In these cases, ΔT could be of major importance, in particular considering ΔT is longer or shorter than 3 years.

These points of criticism are, at the time writing, under investigation by a prospective multicentric study.

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