

# QUALITY OF LIFE OF PATIENTS SUBMITTED TO DECOMPRESSION FOR METASTATIC VERTEBRAL LESION

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## ABSTRACT

**Objective:** To assess health-related quality of life in patients with metastatic vertebral lesion after surgery by the posterior approach. **Methods:** 32 patients were evaluated (17 female and 15 male) with a mean age of 56.46 years and diagnosis of metastatic vertebral lesion. Indications for surgery were the presence of progressive neurological deficit (6 patients – 18.75%); incapacitating pain (23 patients -71.87%) or both of these situations together (3 patients – 9.37%). Questionnaire SF-36 was applied, to evaluate the patients' quality of life one

month and six months after surgery. **Results:** Statistically significant differences were observed in domains of functional capacity, pain, mental health, and social aspects of questionnaire SF-36. **Conclusion:** Patients operated by the posterior approach for decompression for metastatic vertebral lesion presented an improvement in quality of life. **Level of Evidence:** Level II, longitudinal prospective study.

**Keywords:** Spine. Neoplasm metastasis. Decompression. Quality of life.

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## INTRODUCTION

The evolution of oncologic therapies has improved survival time for patients with metastatic lesions. More aggressive treatments targeting the tumor cell combined with efficient and less invasive surgical techniques are crucial in this process. The increased patient survival brought about an increase in the diagnosis and monitoring of metastatic lesions in the spinal column, making spinal cord compression a more common clinical entity.

It is estimated, through studies carried out on cadavers, that the frequency of vertebral lesion in patients that die due to malignant neoplasms ranges from 30 to 90%.<sup>1,2</sup> The spinal column is admittedly the most frequent site of bone metastasis in patients with systemic neoplastic disease<sup>3</sup>, and the skeletal tissue is the third most frequent site of secondary neoplastic lesion, after hepatic and pulmonary lesion.<sup>1</sup>

According to Harrington and other authors, when a vertebral tumor destroys enough bone tissue to result in vertebral collapse and deformity causing pain and neurological complications, treatment with radiotherapy is no longer sufficient<sup>3,4</sup> although surgical treatment and its possible categories generate a great deal of controversy in literature.<sup>5-8</sup>

Initially, presenting inferior results in comparison with isolated

radiotherapy, laminectomy in the vertebral metastatic lesion with spinal cord compression was reserved for cases in which other forms of oncologic treatment had failed. However, nowadays, with the advance of techniques of surgical access, approach and decompression of the lesion and more stable fixation, the results for this association in selected tumors have generated results superior to radiotherapy applied individually.<sup>1,3</sup> Although the surgical treatment of metastatic lesions is still palliative today, new techniques in combination with imaging methods that detect vertebral disease in initial stages have demonstrated better results in long-term evaluations.<sup>2</sup>

The main objectives of surgical treatment are pain control, stability maintenance and preservation of neurological function. According to Ecker *et al.*,<sup>9</sup> surgery is reserved for patients with neurological impairment, radioresistant tumors, vertebral instability and untreatable pain. In their study, Tokuhashi *et al.*<sup>6</sup> noted that the selection of the treatment method that leads to pain relief and significantly improves quality of life in patients with delicate clinical conditions is essential for a satisfactory outcome.

The objective of this study is to assess quality of life in patients operated via posterior approach due to metastatic spinal cord compression in the vertebra.

All the authors declare that there is no potential conflict of interest referring to this article.

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## MATERIAL AND METHOD

Thirty-two cases of patients submitted to the surgical treatment of metastatic vertebral lesion were evaluated during the period from December 2005 to May 2008. The procedure and the pre- and postoperative evaluations were performed by the same team with a principal surgeon at Hospital Estadual Mário Covas, in Santo André. The patients were monitored by a multidisciplinary professional team, together: orthopedist, oncologist, physiotherapist, nurse, nutritionist, psychologist and further specialties when other special care was necessary.

The criteria for surgical indication were the presence of progressive neurological alteration resulting from vertebral instability or direct tumor compression (6 patients– 18.75%); refractory and incapacitating pain due to metastatic spinal cord compression (23 patients– 71.87%) or patients that suffered from a combination of these two conditions (3 patients– 9.37%). The surgical indication due to untreatable pain was defined when there was failure during intrahospital analgesia. The patients' age varied from 28 to 78 years, averaging 56.46 years; 17 (53.12%) patients were female and 15 (46.87%) male.

The etiology of the lesions was determined by the anatomopathological analysis performed in the Pathology Service of Faculdade de Medicina do ABC. (Table 1) At the time of surgical indication only 5 (15.62%) patients presented lesion in a single vertebra; 15 (46.87%) presented lesion in up to 3 vertebrae and 12 (37.50%) presented lesion in more than 3 vertebrae. The thoracic region was the most frequently affected (13 patients–40.62%); while 5 (15.62%) presented lumbosacral lesion, 1 (3.12%) cervical lesion and 13 patients (40.62%) presented lesion in more than one region in the spinal column. At the time of surgery, 19 (59.37%) patients presented bone lesion in extravertebral topography and 13 (40.90%) in other organs such as the liver and lung.

Radiotherapy at the vertebral site of neoplastic lesion preceded surgery in 16 (50%) patients, while chemotherapy was carried out under these conditions in 19 (59.01%). All thirty-two patients underwent decompression via posterior approach and fixation with pedicular instruments was performed on 26 (81.12%). Cases with associated anterior approach were excluded.

Antibiotic prophylaxis was administered in all the cases with cefazoline in intraoperative doses of 2g in IV infusion and maintained for five days after surgery, while 10mg of dexamethasone was administered during the surgical procedure.

The radiographic parameters evaluated in the postoperative radiographies were stabilization maintenance and implant integrity. Recurrence of the lesion was monitored by the clinical picture and magnetic resonance. In the postoperative period, the patients were allowed to sit down on the second day, walk and perform their habitual activities according to pain improvement. External immobilization was indicated only in cases where removal of synthesis material was necessary due to infection or loosening of implant.

Quality of life assessment questionnaires were applied in the preoperative period and 1 and 6 months after surgery. We used the SF-36<sup>(10,11)</sup> scale, which presents 36 items divided into 8 domains (functional capacity, limitation due to physical aspects,

pain, general state of health, vitality, social aspects, limitation due to emotional aspects and mental health) for analysis of the patients' general health status.

We adopted the significance level of 5% (0.050), for application of the statistical tests and used version 17.0 of the Statistical Package for Social Sciences (SPSS) program to obtain the results.

## RESULTS

The time elapsed between the primary lesion diagnosis and surgery ranged from 1 month to 10 years averaging 42 months. We also observed the variation of 10 days to 6 months averaging 2.4 months between the time interval of the initial symptom of vertebral metastasis (pain, neurological alteration or both situations concurrently) and spinal cord decompression. There were 11 (34.37%) patients that died on account of progression of the metastatic disease during follow-up, not reaching the survival target of six months. There were 3 (9.37%) deaths within the first 10 days of postoperative period. The causes were 1 case of acute pulmonary embolism; 1 case of respiratory failure and 1 case of septicemia. There were no deaths during the performance of the procedure; there were 6 (18.75%) cases of postoperative infection, with signs and symptoms manifested in the recent postoperative period; of these, 3 (9.37%) were treated clinically and 3 (9.37%) underwent another procedure for surgical cleaning. Synthesis material had to be removed due to extremely profound contamination in 2 (6.25%) cases.

The decompressed levels averaged 1.59, varying from 1 to 4 levels; the intraoperative evaluation and previous analysis of magnetic resonance images determined the magnitude of the decompression to be performed. Levels that have undergone arthrodesis with instruments averaged 2.65, varying from 1 to 7 levels, according to the intraoperative instability (due to the tumor lesion or as a consequence of extensive decompression). We applied the Friedman test for descriptive and comparative evaluation of quality of life between the three observation times (preoperative, 1 month and 6 months postoperative). For the variables of SF-36, statistical variation was observed in the domains of functional capacity, pain, mental health and social aspects. (Tables 2 to 5) The values obtained in the pain and mental health domains presented an improvement when we analyzed one month postoperative. In the other two domains (functional capacity and social aspects) that presented statistical variation there was a significant improvement only after the evaluation at 6 months. (Figure 1)

There was no statistically significant variation between the age bracket categories when we split the patients up into 2 groups: up to 60 years of age, over 60 years of age, after application of the Mann-Whitney test.

There was no progressive deformity in any case after initial stabilization, even in those cases where the implant had to be removed for treatment of infection at the surgical site; no implant broke or worked loose.

## DISCUSSION

Some authors assert that the surgical procedure for metastatic vertebral lesion is dangerous, costly and equivalent or inferior to isolated radiotherapy; however, others assert that complex

**Table 1. Etiology and location of the lesions.**

Patient	Gender	Age (years)	Lesion etiology	Topography in spinal column	Number of vertebrae affected	Levels decompressed	Levels submitted to arthrodesis
01	Male	78	Prostate	lumbar	2	L4 –L5 (2)	L2-L3-L4-L5-S1 (4)
02	Male	46	Multiple myeloma	lumbar	2	L3 (1)	L2-L3-L4 (2)
03	Male	48	Multiple myeloma	thoracic	3	T6-T7-T8 (3)	T4-T5 (3) T9-T10-T11
04	Male	74	Gastric cancer	Thoracic and lumbar	3	L1 (1)	T12-L1-L2(3)
05	Female	55	Multiple myeloma	Thoracic	2	T6 (1)	T4-T5 (2) T7-T8
06	Male	60	Malignant neoplasm of pleura	Thoracolumbar and lumbar	3	T12-L1 S1 (3)	T11-T12-L1 (3)
07	Female	48	Lung adenocarcinoma	Thoracic and Lumbosacral	3	T12-L1 (2)	T11-T12-L1-L2 (4)
08	Male	61	Gastric adenocarcinoma	Thoracic	2	T5-T6 (2)	_____
09	Male	53	Bladder adenocarcinoma	Thoracic	1	T12 (1)	T10-T11-L1-L2 (4)
10	Female	60	Renal cancer	Thoracic	1	T11 (1)	T10-T11-T12 (2)
11	Female	36	Breast adenocarcinoma	Thoracic and lumbar	6	T6-T7 (2)	_____
12	Male	60	Intestinal adenocarcinoma	Thoracic	2	T10-T11 (2)	T9-T10-T11-T12 (3)
13	Male	57	Prostate adenocarcinoma	Thoracic	3	T4-T5-T6 (3)	T4-T5-T7-T8 (3)
14	Male	46	Intestinal adenocarcinoma	Cervical Thoracic and Lumbosacral	+ than 10	L5-S1 (2)	-----
15	Female	65	Non- Hodgkin's lymphoma	Thoracic	4	T8 (1)	T6-T7-T9-T10
16	Female	64	Breast adenocarcinoma	Thoracic	4	T3-T4 (4) T7-T8	T6-T7-T8-T9 (3)
17	Male	66	Lung adenocarcinoma	Thoracic	2	T8-T9 (2)	T6-T7-T10-T11 (3)
18	Male	60	Multiple myeloma	Thoracic and Lumbosacral	+ than 10	T8 (1)	_____
19	Female	69	Lymphoma	Thoracic and Lumbosacral	5	L3 (1)	L1-L2-L3-L4 (3)
20	Female	25	Melanoma	Lumbar	2	L3 (1)	L1-L2-L4-L5 (3)
21	Female	43	Breast adenocarcinoma	Thoracic and Lumbar	9	T8 (1)	T6-T7-T9-T10 (3)
22	Female	43	Gastric adenocarcinoma	Cervical Thoracic Lumbar	+ than 10	C5 and L5 (2)	C4-C5-C6 L3-L4-L5-S1(5)
23	Female	73	Breast adenocarcinoma	Cervical and Lumbar	6	T1 and L3 (2)	C6-C7-T1-T2 T7-T8-T9-T10-T11 (7)
24	Male	68	Anorectal adenocarcinoma	Thoracic	1	T4 (1)	_____
25	Female	50	Breast adenocarcinoma	Cervical and Lumbosacral	7	C4 (1)	C3-C4-C5 (2)
26	Female	58	Multiple myeloma	Cervical and Lumbosacral	2	L4 (1)	L3-L4-L5-S1 (3)
27	Male	55	Renal tumor (clear cells)	Thoracic and Lumbosacral	2	L1 (1)	T12-L1-L2 (2)
28	Male	58	Prostate adenocarcinoma	Cervical	1	C5 (1)	C4-C5-C6 (2)
29	Female	62	Breast adenocarcinoma	Lumbosacral	1	L2 (1)	L1-L2-L3-L4 (3)
30	Female	56	Breast adenocarcinoma	Thoracic	4	T9 (1)	T7-T8-T9-T10 (3)
31	Female	51	Multiple myeloma	Lumbosacral	2	L3-L4 (2)	L2-L3-L4-L5 (3)
32	Female	59	Breast adenocarcinoma	Cervical, Thoracic and Lumbosacral	+ than 10	C4 (1)	_____

**Table 2. Functional capacity domain in the SF 36 questionnaire.**

Set of Variables	N	Mean	Standard deviation	Minimum	Maximum	25th Percentile	Median	75th Percentile	Sig. (p)
PRE_Fun_cap	21	20.00	29.20	0.00	80.00	0.00	0.00	37.50	< 0.001
MES1_Fun_cap	21	15.00	12.55	0.00	40.00	5.00	10.00	25.00	
MES6_Fun_cap	21	31.19	23.39	0.00	70.00	10.00	20.00	55.00	

**Table 3. Pain domain in the SF 36 questionnaire.**

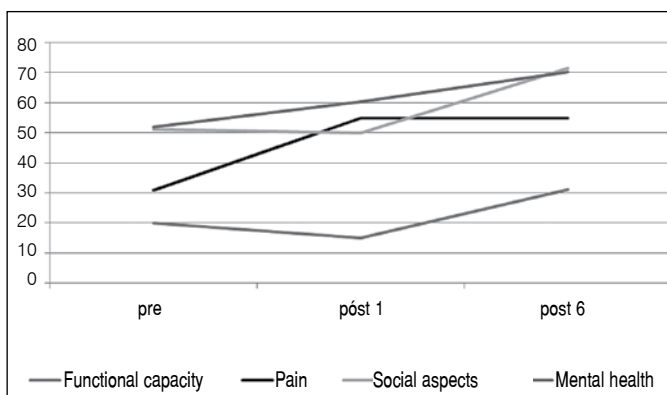
Set of Variables	n	Mean	Standard deviation	Minimum	Maximum	25th Percentile	Median	75th Percentile	Sig. (p)
PRE_Pain	21	30.95	24.27	0.00	80.00	20.00	20.00	50.00	0.004
MES1_Pain	21	54.76	19.90	10.00	80.00	50.00	60.00	70.00	
MES6_Pain	21	54.76	18.61	10.00	100.00	50.00	50.00	60.00	

**Table 4. Social domain in the SF 36 questionnaire.**

Set of Variables	n	Mean	Standard deviation	Minimum	Maximum	25th Percentile	Median	75th Percentile	Sig. (p)
PRE_Soc_asp	21	51.19	27.36	25.00	100.00	25.00	37.50	62.50	< 0.001
MES1_Soc_asp	21	50.00	23.39	0.00	87.50	37.50	50.00	62.50	
MES6_Soc_asp	21	71.43	15.88	37.50	87.50	62.50	75.00	87.50	

**Table 5. Mental Health domain in the SF 36 questionnaire.**

Set of Variables	n	Mean	Standard deviation	Minimum	Maximum	25th Percentile	Median	75th Percentile	Sig. (p)
PRE_Mental_health	21	51.81	23.48	8.00	88.00	36.00	52.00	68.00	< 0.001
MES1_Mental_health	21	60.38	12.13	44.00	84.00	50.00	60.00	64.00	
MES6_Mental_health	21	70.10	15.05	24.00	84.00	60.00	72.00	84.00	



**Figure 1. Comparison between quality of life and time.**

procedures can be performed with good results.<sup>12</sup> Historically, due to poor results, laminectomy has been reserved for certain conditions such as vertebral instability, untreatable pain or failure in the treatment with radiotherapy.<sup>5-8,12,13</sup>

Nowadays surgery has a central role in the treatment of metastatic lesions of the spinal column. According to Defino *et al.*<sup>14</sup> the surgical treatment of vertebral metastatic lesions has achieved growing acceptance in recent years, especially due to the quality of life it affords patients. Recent publications in literature have demonstrated superior results with aggressive resection of vertebral metastasis in highly selected patients, in association with postoperative radiotherapy or on its own, in comparison to the application of isolated radiotherapy.<sup>1,2</sup> Isolated radiotherapy is efficient in cases of lesions secondary to radiosensitive tumors, such as plasmacytoma and multiple

myeloma, and does not result in a significant improvement of the neurological deficit. Some lesions are typically resistant to radiotherapy, such as tumors of renal cells and of the gastrointestinal tissue, where surgery is of vital importance to the treatment.

Metastatic spinal cord compression produces symptoms such as pain, loss of mobility and incontinence; these symptoms bring about an important reduction in the quality of life of the oncology patient and in these situations life clinical treatment is not efficient.<sup>5,12</sup> Surgery for the tumor lesion has potential benefit in neurological function, pain, mobility and overall quality of life.<sup>13</sup> Today there is consensus that spinal cord compression surgery is palliative, yet providing the criteria for its indication are respected, there is an important benefit involving the quality of life of patients.<sup>14</sup> According to Leithner *et al.*<sup>8</sup>, an individual therapy should be chosen to lead to a maximum palliative effect (pain reduction, restoration of stability and function) with minimum operative morbidity and mortality.

Controversy persists over the indication of the treatment category: surgical, radiotherapy, chemotherapy or a combination of these treatments.<sup>15</sup> According to Tomita *et al.*<sup>5</sup>, oncology specialists are the best professionals to identify which type of treatment is most appropriate for each patient and the evaluation of the prognosis. Evaluation of the surgical treatment of spinal column tumors entails significant limitation due to the etiology heterogeneity, clinical conditions, and degree of involvement of the tumor in the spinal column of the patients studied.<sup>14</sup> In our study we only included the patients operated by posterior approach as an attempt to standardize the surgical technique, yet the decompression levels, arthrodesis, tumor type and previous treatment were numerous.

In vertebral tumors metastases are very frequent and due to their local aggressiveness, the symptoms develop early and rapidly, significantly compromising the quality of life of patients.<sup>16-19</sup> According to Heary and Bono<sup>20</sup>, vertebral lesion secondary to lung neoplasms is the most frequent in men and breast metastasis is the most frequent in women. In our study, the most frequent lesions that needed spinal cord decompression were metastasis from breast carcinoma (25%) and multiple myeloma (18.75%).

According to Villavicencio *et al.*<sup>13</sup>, although the lumbar spine is the most common site of vertebral metastasis, around 70% of symptomatic lesions occur in the thoracic spine. Our study also presented predominance of symptomatic lesions in thoracic region, numbering 23 (71.87%); even in patients with more than one lesion in the spinal column, the symptomatic lesion was in the thoracic region.

We observed a lengthy interval between the start of symptomatology with the vertebral metastatic lesion (pain, neurological alteration or both conditions concomitantly) and surgery, averaging 2.4 months, due to the fact that the population studied is of low socioeconomic status and rarely reveal their symptoms, for which reason the lesions are diagnosed late.

Weigel *et al.*<sup>18</sup>, in a retrospective study involving 45 patients with neurological deficit due to vertebral metastatic lesion, obtained a rate of improvement of 62% in neurological function after anterior decompression and 50% after laminectomy. Although studies point to better functional results with extensive decompressions provided by anterior access in comparison to laminectomy and posterior stabilization, there are no sufficiently consistent data in literature.

Only 21 (65.62%) patients completed the questionnaires for postoperative assessing at 6 months; 11 patients (34.37%) died during this period. Hussein *et al.*<sup>4</sup>, in a similar study involving 21 patients, encountered 11.3 months of mean survival; Yamashita *et al.*<sup>21</sup> encountered mean survival of 8 months due to systemic progression of the neoplasia.

According to Tomita *et al.*<sup>5</sup> postoperative infection rates are relatively high in these cases, due to the severity of the clinical conditions of oncology patients. In our study we obtained six (18.75%) cases of infection related to the surgical procedure and we believe that the general state, radiotherapy and systemic chemotherapy of the metastatic disease contributed to this complication.

In the referred pain analysis through the SF36 questionnaire we observed a statistically significant improvement in the evolution of this complaint; we evidenced that there is also a statistically significant difference in the paired comparison between pain analysis in the preoperative period and at 1 month ( $p < 0.001$ ), as well as in the evaluation of pain in the preoperative period and at 6 months ( $p = 0.012$ ); however, the values obtained in the pain evaluation at 1 and 6 months, when paired for comparative analysis, did not present a statistically significant change, demonstrating the considerably and early of pain in patients submitted to spinal cord decompression secondary to metastatic lesion. These findings are similar to other studies that report at least moderate pain relief in 90 to 100% of the cases operated with the anterior or posterior approach acutely.<sup>18,19</sup>

The functional capacity of the patients analyzed presented a significant improvement particularly as many of these patients were hospitalized prior to surgery due to pain and neurological deficit.

The physical, vitality and emotional domains presented higher final mean values than in the initial evaluation, yet this difference was not statistically significant. The values of the general state presented a lower final mean value than the initial values, yet there was no statistically significant difference in this analysis, possibly due to the neoplastic progression.

## CONCLUSION

The patients operated with posterior approach for decompression and fixation in metastatic lesions of the spinal column exhibited an improvement in quality of life.

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