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Research Article / Araştırma Makalesi

Evaluation of Multiple Myeloma Patients Performed Decompression Due to Spinal Cord Pressure

Omurilik Basısı Nedeniyle Dekompresyon Uygulanan Multipl Miyelom Olgularının Değerlendirilmesi

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Abstract: Multiple myeloma accounts for 5-10% of all cancers associated with spinal cord compression. In this study, the surgical results of patients with multiple myeloma operated for spinal epidural compression were evaluated. Between 2011 and 2017, twenty-one patients were operated by posterior decompression for spinal cord compression, whose pathological diagnosis was multiple myeloma in our hospital's neurosurgery clinic included in the study. Demographic, clinical and radiological features of the patients and their status after surgery were examined. The mean age of the 21 patients was 62.6 ± 9.3. Thirteen patients were male and 8 were female. When the chain isotype was found in protein electrophoresis, the maximum IgG (52.4%) was present. The mean Karnofsky performance of the patients was 46.2 ± 17.7. Significant improvement was observed in the postoperative motor strength of the patients (p = 0.0001). In addition, postoperative pain-VAS scores-was significantly reduced (p = 0.0001). 90% of the patients were operated under emergency conditions. The number of patients who were operated stabilization with decompression was 5 (23.8%). When the radiological data were analyzed, the mean amount of compression in the operated vertebrae was 33.1% and the mean shrinkage rate of the tumor was 65.4%. Although spinal canal narrowing was observed in all patients, compression fracture was present in 16 patients (76.2%). The mean follow-up period was 22.3 months. During the follow-up period, 9 patients died, 5 of them were in the first year. Postoperative complications were wound infection in 2 patients, chronic renal failure in 1 patient and bilateral pleural effusion in 1 patient. Surgical treatment should be the first option if there is a progressive neurological deficit in patients with spinal cord compression due to multiple myeloma. With surgical treatment, decompression of the spinal cord compression, pain control and stabilization can be performed.
Key Words: Multiple myeloma, spinal tumor, spinal cord compression, decompression.

Özet: Multipl miyelom omurilik kompresyonuyla ilişkili tüm kanserlerin % 5-10' unu oluşturur. Bu çalışmada spinal epidural bası nedeniyle opere edilen multipl miyelom olan hastaların cerrahi sonuçlar değerlendirildi. 2011-2017 yılları arasında hastanemiz nöroşirurji kliniğinde omurilik basısı nedeniyle posterior girişimle dekompresyon yapılan ve patolojik tanısı multipl miyelom olan 21 hasta çalışmaya dahil edildi. Hastaların demografik, klinik ve radyolojik özellikleri incelendi. 21 hastanın yaş ortalaması 62.6±9,3' tü. Hastaların 13' ü erkek ve 8' i kadındı. Protein elektroferezinde zincir izotipine bakıldığında en fazla Ig G (%52.4) bulunuyordu. Hastaların Karnofsky performans değeri ortalama 46.2±17,7 idi. Hastaların ameliyat öncesine göre postoperatif motor güçlerinde belirgin iyileşme görüldü (p=0,0001). Ayrıca VAS skorlarına bakıldığında postoperatif ağrının belirgin olarak azaldığı tespit edildi (p=0,001). Hastaların %90' ının acil şartlarda ameliyata alındığı görüldü. Ameliyat sırasında dekompresyona ilave olarak stabilizasyon yapılan hasta sayısı 5' ti (%23.8). Radyolojik veriler incelendiğinde opere edilen vertebra segmentindeki ortalama çökme miktarı oranı %33.1 ve tümörün spinal kanal çapını ortalama daraltma oranı %65.4 olarak hesaplandı. Tüm hastalarda spinal kanal çapında daralma olmasına rağmen, çökme kırığı 16 hastada (%76.2) vardı. Ortalama takip süresi 22.3 ay idi. İlk bir yılda 5 hasta olmak üzere, takip süresinde 9 hasta kaybedildi. Ameliyat sonrası komplikasyon olarak 2 hastada yara yeri enfeksiyonu, 1 hastada kronik böbrek yetmezliği ve 1 hastada da bilateral plevral efüzyon gelişti. Multipl miyelom nedeni ile omurilik basısı olan hastlarda ilerleyici nörolojik defisit varsa cerrahi tedavi ilk seçenek olmalıdır. Cerrahi tedavi ile omurilik basısının dekompresyonu, ağrı kontrolü ve stabilizasyonu yapılabilir.
Anahtar Kelimeler: Multipl miyelom, spinal tümör, omurilik basısı, dekompresyon.

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1. Introduction

Multiple myeloma (MM) is characterized by the clonal proliferation of neoplastic plasma cells that produce osteoclast activators and osteoblast inhibitory factors (1). This plasma cell dyscrasia is seen in 5-10/100.000 people annually, whereas lesions are most commonly found in the spine (2). It is usually diagnosed with bone or neurological lesions and those can cause serious morbidity (3,4). The cause of spinal epidural compression might be vertebral compression, due to extension from adjacent vertebrae or without local bone involvement (4).

In this study, patients with spinal epidural compression and multiple myeloma were examined retrospectively and surgical results were evaluated.

2. Material and Methods

This study was carried out with the approval of the local ethics committee dated 27.10.2017 and numbered 2017-04005.

Between 2011 and 2017, 21 patients who underwent posterior decompression due to spinal cord compression in our clinic, who were not diagnosed before and diagnosed with MM in pathological samples were included in the study. 3 patients who operated by decompression but whose data could not be reached, and patients who underwent with only biopsy, vertebroplasty, and unoperated patients were excluded from the study.

Age, gender, spinal levels of the patients, stabilization and postoperative complications were recorded using hospital archives. In addition, their general status at the time of appeal was evaluated according to the Karnofsky performance scale. The best motor powers in the lower extremity before and one week after the operation were evaluated by examination (0 = None-5 = Full). In addition, neurological findings were evaluated with the severity of pain VAS (Visual Analog Scale) according to ASIA (American Spinal Injury Association). Computed tomography (CT) images were examined to determine the compression rates in the vertebrae. For this, the average of one upper and one lower vertebra heights was used. Spinal canal diameter narrowing ratio was calculated by magnetic resonance imaging (MRI) (Figure 1).

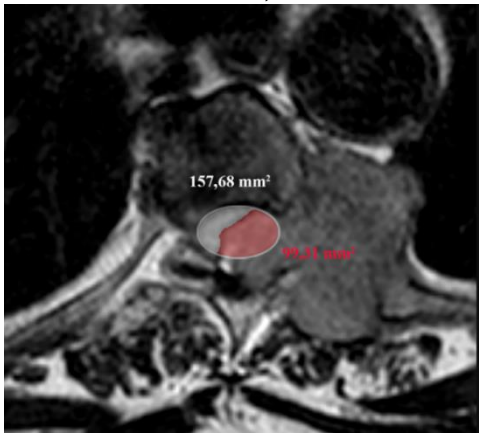

Figure 1. Calculation of the rate of spinal canal invasion of the fifth thoracic vertebra in T1 axial MRI. (White shaded area: Spinal canal, Pink shaded area: Tumor invasion)

Statistical analysis was done by the NCSS (Number Cruncher Statistical System) 2007 Statistical Software (Utah, USA) package program. In addition to descriptive statistical methods (mean, standard deviation), paired t-test in time comparisons of variables with normal distribution, Mann-Whitney U test for comparison of binary groups of non-normally distributed variables, Mc Nemar's test for comparison of qualitative data, Pearson correlation test to determine the relationship between variables used. The results were evaluated at $p < 0.05$ level.

3. Results

The mean age of the 21 patients was 62.6 ± 9.3 (45-76; min-max). 13 (61.9%) patients were male and 8 (38.1%) were female. The chain isotype was examined in the protein electrophoresis of the patients and predominantly IgG. No heavy or light chain isotype could be detected in 3 patients. When the general status of the patients was examined, the mean Karnofsky performance was 46.2 ± 17.7 (20-80; min-max). Preoperatively,3 patients (14.3%) had ASIA A and 3 patients had ASIA E. (Table 1)

The mean postoperative motor strength of the patients was statistically significantly higher than the preoperative values (p = 0.0001). In addition, preoperative and postoperative VAS scores were significantly decreased after surgery (p = 0.0001) (Table 2). There was a statistically significant correlation between preoperative VAS values and Karnofsky performance values (r = 0,492 p = 0,023). Nineteen of the patients (90.4%) were operated in emergency situations. The number of patients who operated stabilization with decompression was 5 (23.8%). All patients with ASIA E had stabilization due to instability. After chemotherapy and radiotherapy, 3 (14.3%) patients were stabilized due to instability.

Table1. Clinical and laboratory findings of patients

	n	*%*
Gender		
Male	13	61,9
Female	8	38,1
The chain isotype		
Ig A	4	19
IgG	11	52,4
Light chain	3	14,3
None	3	14,3
Karnofsky performance		
d < 40	7	33,3
40 ≤ d < 70	4	19
d ≥70	10	47,7
Preoperative ASIA		
A	3	14,3
B	2	9,5
C	7	33,3
D	6	28,6
E	3	14,3
Postoperative ASIA		
A	2	9,5
B	0	0
C	7	33,3
D	5	23,9
E	7	33,3

n= Number, Ig= Immunoglobulin, ASIA= American Spinal Injury Association.

Table 2: Comparison of preoperative and postoperative motor strength averages and VAS score averages

	Preoperative	Postoperative	*p*
Motor strength	2,38±1,75	3,24±1,67	**0,0001**
VAS	8,29±1,68	3,67±1,85	**0,0001**

VAS= Visual Analog Scale

When the radiological data of the patients were examined, the mean rate of compression of the vertebral segment was 33.1% (0-86.4%; min-max) and the average shrinkage rate of the spinal canal diameter of the tumor was 65.4% (30.3% -81.6%; min-max). Although spinal canal narrowing was observed in all patients, compression fracture was present in 16 patients (76.2%). In addition, there was no statistically significant correlation between the mean vertebral compression rate and the age of the patients (r = -0,231 p = 0,314). No significant difference was observed in the intra-canal pressure and compression ratio of male and female patients (p = 0,663; p = 0,276, respectively) (Table 3).

Table 3: Comparison of spinal canal compression and vertebra collapse rates between genders

	Male (n:13)	Female (n:8)	*p*
Spinal Canal Compression (%)	67,25±13,55	62,44±18,11	0,663
Collapse (%)	29,41±29,07	39,23±24,51	0,276

Multiple vertebra involvement was observed in all patients. (Figure 2). The most involved vertebra segment was T8 (Figure 3). The mean follow-up period was 22.3 months (1 month-60 months; min-max). 9 patients died in the first year, 9 patients died during the follow-up period. Two patients, with Karnofsky performance score was 20, died because of pneumonia and pulmonary embolism at the first postoperative month. In addition, postoperative complications were wound infection in 2 patients, chronic renal failure in 1 patient and bilateral pleural effusion in 1 patient.

Figure 2. T1-contrast sagittal MRI shows multiple myeloma involvement in multiple vertebrae (white arrows).

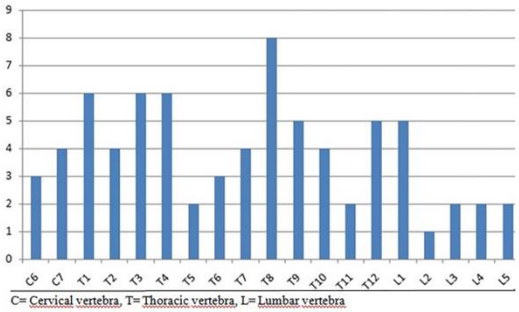

Figure 3. Number of vertebrae with multiple myeloma invasion.

4. Discussion

Spinal cord compression is a complication seen in 2-5% of all patients with cancer. MM constitutes 5-10% of all cancers associated with spinal cord compression (5). Treatment options for this cell dyscrasia include surgery, chemotherapy, and sometimes additional radiotherapy. The aim of surgery is to decompress neural structures, pain control, stabilization for instability and early mobilization (6). It is still controversial for patients with spinal cord compression to be the first choice of treatment. While neurological deficits are recovering rapidly with surgical treatment, improvement in patients receiving radiotherapy takes longer. However, there are studies showing that complications of radiotherapy are less than surgery (7,8,9). However, Rehak et al. (10) suggested that the surgical approach for these tumors should be considered for long survival.

The need for surgical treatment in MM patients is still being discussed. According to Kim et al. (11), conservative and palliative treatments are the mainstay of these lesions; however, timely surgical interventions should be considered for progressive neurological deficits and pathological fractures. In another study, it was argued that surgery should be the first choice with acceptable complication rates and rapid recovery in patients with neurological findings (12). It determines the surgical approach and the preferences of the clinics and the operating team. We preferred the posterior approach in all patients, even from the anterior spinal cord. Flouzat-Lachaniette et al. (13) applied the anterior approach to 4 of the 11 patients who were operated on in the series of 44 patients. In another study, it was reported that 10% of patients had anterior intervention and venous thrombus and wound infection were the most common postoperative complications (12). Two of our cases had wound infection, but no repeat surgery was required in these patients.

Guzik (14) classified the pain of patients as neurogenic, mechanical and somatic and reported the most mechanical pain in patients with vertebral compression fractures. He also reported that the postoperative pain of the patients decreased significantly. Similarly, in our series, the pain of the patients decreased. In another study, it was reported that the pain was significantly reduced in all patients treated whether it was operated or not; It has also been shown that neurological deficit is regressed rapidly with surgery (15). Denaro et al. (12), the rate of ASIA B and C preoperatively was high, and after decompression, most of the patients had a lower neurological deficit.

Radiological images of most MM patients show diffuse bone loss, focal osteolytic bone lesions, bone marrow edema, and axial fragility. In addition, MM is seen in elderly patients and these patients have a high rate of osteoporosis. However, we found that there was no correlation between the mean vertebral compression rate and the age of the patients. Structural instability between the vertebrae segments may be the first sign of impending fractures (16). Fractures are frequently seen in the axial axis because of the fragility. Three-quarters of our patients had an evident

compression fracture Guzik has calculated this ratio as 76% (14). Studies have been shown that: age, sex, spinal level, and epidural tumor amount not play an important role than 30% compression of the vertebrae (13). Epidural compression occurs in 20% of the MM cases and this requires urgent treatment in the event of progressive neurological deficits. Epidural compression may be due to a pathological fracture or may be due to a non-bone extension (17).

It has been shown that survival rates are higher; when surgery and radiotherapy are applied in treatment (18). In another study, stereotactic radiosurgery was applied to patients, in 38 patients this study reported that pain control was 1.6 months and local pain control was reported in %91 patients at the end of one year (19).

When the studies are performed, it is seen that the most involved vertebral region is the lower thoracic and thoracolumbar junction (11). In our series, although we had frequent involvement in the thoracolumbar region, the involvement of the upper thoracic vertebrae was also high. MM is common in multiple vertebral segments. Rades et al. (8) reported three or more vertebral involvements as 57%. Due to the multiple vertebral involvements, spinal MRI –cervical, thoracic and lumbar- should be performed to ensure that the treatment can be planned correctly. Because X-ray or CT cannot be seen lesions can also be detected (20).

The most important limitation of this study is that it is retrospective. Another limitations: Comorbidities of patients and additional treatments applied to patients after surgery were not evaluated in the study. Because of that further well-designed and multi-institutional prospective studies are required.

5. Conclusion

As a result; when the surgical results of patients with multiple myeloma due to compression of the spinal canal with neurological deficits are examined, it is seen that there is a rapid neurological improvement and an acceptable complication rate. In addition to neurological deficits, segmental instability can often be treated with the posterior approach. In addition to surgical treatment, chemotherapy, radiotherapy, and supportive treatments are usually required for these patients.

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