Özgün Klinik Araştırma

Retrospective Experiences in Spinal Tumor Surgery: Heading for New Perspectives and Future Insights

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✔ **Aim:** Spinal tumours have benign characteristics, and constitute nearly 10-25 % of central nervous system tumours. Locations, growth rates, and cellular types of spinal tumours, and the techniques applied are important prognostic parameters. This study examined the effects of accurate diagnosis, appropriate approach, emergency action, microsurgery and operation techniques on prognosis.
Materials and Methods: Radiologically diagnosed and surgically confirmed hospital records of 119 cases who were operated in our clinics between January 2000 and December 2010 were investigated. Retrospective analysis of the cases was conducted by recording data on age, and gender of the patient together with location, symptomatology, surgical and histological grade, and stage of the tumor q. Sharp tumoral dissection, electrocauterization, blood transfusion, foreign body applications, local drug use, and instrumentations were avoided A drain was used for the cases included in the present study. Gadolinium-enhanced MRG scan was performed in all cases, postoperatively. Diagnoses were confirmed by postoperative histopathological examinations. The cases were analyzed using clinical parametres, radiological and other laboratory findings and the results of the discussion were recorded. Possible reasons for the positive and negative results, rarely seen in the spinal surgery, were investigated retrospectively and anterospectively.
Results: Of 119 cases, 50.4 % were female and 49.6 % were male. Tumours were found in thoracal (57.9 %), lumbosacral (26.2 %) and cervical (15.9 %) locations. While extradural tumours (51.3 %) were by far the most common spinal tumours, the frequency of intradural extramedullary, and intramedullary tumours were 38.6 %, and 10.1 %, respectively. Half of the extradural tumours were of metastatic type. Other extradural masses were primary spinal tumours. Meningioma was the most common type of intradural tumour. During the postoperative follow-ups, non-specific pain and dysesthesia disappeared in almost all cases, but neurological deficit resolved only in 9 patients.
Conclusions: In tumour surgery, due to the possibility of vasomotor and autonomic dysfunctions, high voltage monopolar cautery should not be used unless necessary.

Key words: Spinal tumours, monopolar electro cautery, prognosis, surgery

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Spinal Tümör Cerrahisinde Retrospektif Deneyimler: Yeni Doğru Bakışlar ve Geleceğe Ilhamlar

✔ **Amaç:** Santral sinir sistemi tümörlerinin yaklaşık %10-25'ini oluşturan ve genellikle benign karekterli olan spinal tümörlerin lokalizasyonları, büyüme hızları, hücresel tipleri ve uygulanan teknikler prognozu belirleyen en önemli parametrelerdir. Bu çalışmada doğru tanı, uygun yaklaşım, acil girişim, mikrocerrahi ve operasyon tekniklerinin prognoz üzerine etkisi araştırıldı.
Materyal ve Metod: Kliniklerimizde Ocak 2000-Aralık 2010 yılları arasında ameliyat edilen tanısı radyolojik olarak konulmuş ve cerrahi olarak doğrulanmış 119 olguya ait kayıtlar incelendi. Yaş, cinsiyet, lokalizasyon, semptomatoloji, cerrahi ve histolojik tip ile ilgili veriler kaydedilerek retrospektif analiz edildi. Sharp diseksiyon, elektrokoterizasyon, kan transfüzyonu, yabancı cisim ablikasyonu, lokal ilaç kullanımı ve enstrumantasyondan kaçınıldı. Vakalara dren kondu. Postoperatif tüm vakalara gadaloniumlu kontrol MRG çekildi. Tanılar, postop histopatolojik olarak teyit edildi. Klinik durum, radyolojik ve diğer laboratuar bulguları eşliğinde vakalar analiz edilerek tartışma bulguları kayıt edildi. Spinal cerrahide nadir rastlanan olumlu ve olumsuz sonuçların muhtemel nedenleri retro ve anterospektif olarak araştırıldı.
Bulgular: Olguların % 50.4'ü kadın, % 49.6'ı erkekti. Tümörler sıklık sırasına göre torakal (% 57.9), lumbosakral (% 26.2) ve servikal (% 15.9) lokalizasyonda idi. Ekstradural (% 51.3) yerleşim ilk sırayı alırken, intradural extrameduller (% 38.6), intradural intrameduller (% 10.1) sıklığında idi. Ekstradural olanların yarısı metastaz idi. Diğer ekstradural kitleler omurganın primer tümörleri idi. İntradural olanlarda menenjioma ilk sırayı almaktaydı. Hastaların hemen hepsinin postoperatif takiplerinde non spesifik ağrı ve disestezi düzelirken, nörolojik defisitte düzelme 9 hastada izlendi.
Sonuçlar: Tümör cerrahisinde, yüksek voltajlı monopolar koter gelişebilecek vazomotor ve otonomik disfonksiyonlar nedeniyle zorunlu olmadıkça kullanılmamalıdır.

Anahtar kelimeler: Spinal tümörler, monopolar elektro koter, prognoz, cerrahi

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Spinal tumours have higher morbidity and mortality rates, and are the focus of interest among neurosurgeons thanks to the favourable outcomes obtained with early diagnosis and appropriate treatment methods. Success rates of treatment have increased along with the increasing number of diagnostic tools associated with the development of technological and surgical techniques, especially in the field of microsurgery.

Spinal tumours constitute 10-25 % of all central nervous system tumours. Categorizing spinal tumours according to their locations is convenient for diagnosis and treatment. For this reason, their spatial relation to dura mater should be taken into account while making any classification [8,18,19]. Spinal tumours are classified as extradural, intradural, extramedullar and intramedullar tumours. The ratio of intradural to extradural tumours is 2:3. Of all spinal tumours, 55 % of them are extradural, 40 % are intradural extramedullary and 5 % are intradural intramedullary [8,19,29]. Most extradural tumours are metastatic and the remainder are primary spinal tumours. Neurofibroma and meningioma constitute most of the extramedullar spinal tumours. Of the intramedullar spinal tumours, 90 % of them consist of ependymomas, astrocytomas and hemangioblastomas [5,6,15,19,23,27,29]. Localization, growth rate and cellular types of the spinal tumours and the operative techniques applied are important prognostic parameters. This study sought to examine the effects of accurate diagnosis, appropriate approach, emergency action, microsurgery and operation techniques on prognosis.

MATERIALS and METHODS

Radiologically diagnosed and surgically confirmed hospital records of 119 cases operated in our clinics between January 2000 and December 2010 were examined. Retrospective analysis of the cases was conducted by recording data on age, gender of the cases, location, symptomatology surgical and histological type of the tumour.. Tumour resection was carried out in all patients using an elective posterior microsurgery approach. Gross total resection using microsurgical methods was performed in 10 out of 12 cases with intradural intramedullary, and in 43 of 46 patients with intradural extramedullary tumours. Microsurgical subtotal resection was performed in all 61 cases with extradural tumours. Histopathological diagnosis of an extradural case in the upper cervical region was reported as meningioma. The tumour was extracted totally. Sharp dissection, electrocauterization, blood transfusion, foreign body application, local drug use and instrumentation were avoided. Drain was used in the cases included in the present study. Gadolinium-enhanced MRI scan was conducted in all cases, postoperatively. Diagnoses were confirmed by postoperative histopathological examination of biopsy materials. The cases were evaluated using clinical parameters , radiological and other laboratory findings and then the results of the discussion were recorded. Possible reasons for the positive and negative results were analysed retrospectively and anterospectively. The results were compared with the findings of the experimental spinal surgery techniques. The diagnoses were confirmed histopathologically.

RESULTS

Of the cases, 50.4 % were female and 49.6 % were male. The ages of the patients ranged between 1-86 years with a mean age of 46.3 years. Tumours were in the thoracal (57.9 %), lumbosacral (26.2 %) and cervical (15.9 %) locations (Table 1). While extradural tumours (51.3 %) were by far the most common spinal

Table 1. The incidence of spinal tumors by localization.

Localization	The number of patients	%
Cervical region	12	15.2
Thoracic region	48	60.7
Lumbar region	19	24.1

tumours, the incidences of intradural extramedullary, and intramedullary tumours were 38.6 % and 10.1 %, respectively (Table 2). Half of the

Table 2. The incidence of spinal tumors by the relation duramater.

Settlement	The number of patients	%
Intradural intramedullary	10	12.6
Intradural extrameduller	29	36.7
Ekstradural	40	50.7

Figure 1. Sagittal T2 magnetic resonance image showing an enhancing epidural mass from C1 to C2.

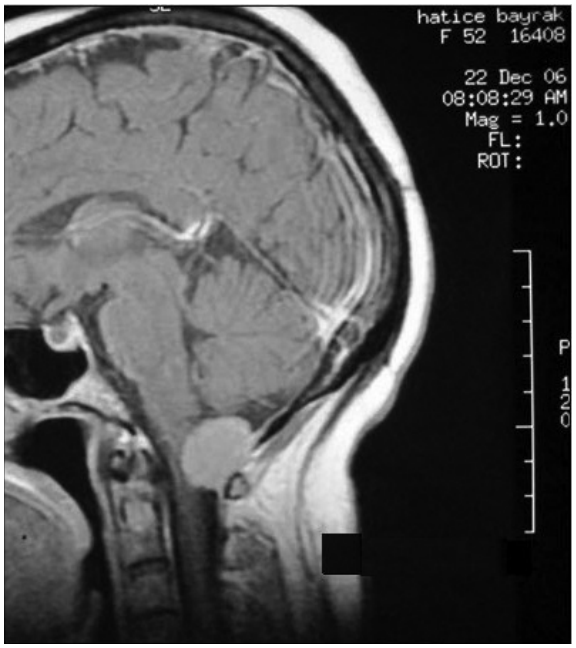

Figure 2. Axial T2 magnetic resonance image showing an enhancing epidural mass with spinal cord displacement and compression.

Figure 3. Postoperative sagittal T2 magnetic resonance image showing total resection of epidural mass.

Figure 4. Postoperative axial T2 magnetic resonance image showing total resection of epidural mass.

extradural tumours were metastatic and the other half consisted of primary tumours. Meningioma was the most common type among intradural tumours. In one case with an extradural tumour, meningioma was found in the cervical region, and it was extracted totally (Figures 1, 2, 3, 4). Almost all patients reported nonspecific pain and motor deficits (n=29), and dysesthesias (n=39) were also detected (Table 3). Any mortality was not seen in our study. In the postoperative follow-ups of almost all patients, nonspecific pain and dysesthesia disappeared while neurological deficits persisted apart from 9 patients.

Table 3. The incidence of spinal tumors according to the complaints of the applicant.

Findings	The number of patients	%
Non-specific pain	79	100
Motor deficit	29	36.7
Dysesthesias	39	49.3

DISCUSSION

Approximately 70 % of the intradural extramedullary tumours, which constitute 40 % of all spinal tumours are mostly (90 %) benign and totally extractable, and rarely (0-10 %) malign tumours.

For the management of intradural extramedullary tumours, gross total resection is possible and necessary to a great extent. It has been shown that safe and successful outcomes could be achieved using microsurgery [5,6,15,19,23,27,29]. The remaining 30 % of the intradural extramedullary tumours are malignant and metastasize. Monotherapy is not sufficient for their management, and, for the proximal and distant metastases, adjuvant treatment methods such as radiochemotherapy, fusion, and plastic surgery are required, along with the secondary surgery [9,12,16,17,20,30]. Phantom pains may occur after spinal tumour surgery, ie. following the relief of cauda equina syndrome secondary to intradural extramedullary tumours [1]. In our study, phantom pain occurred in one patient who underwent foot amputation. In our study, patients with metastases were referred to radiotherapy and chemotherapy. Therefore, proximal-distant metastases should be thoroughly sought, and histopathological analyses should be performed to enable early initiation of radio-chemotherapy.

Overall, 45 % of the intradural and intramedullary spinal tumours are astrocytomas and 35 % of them are ependymomas. Intramedullary spinal tumours constitute about 20-30 % of all intradural tumours in adults. Hemangioblastoma is another common intramedullary tumour. In a study involving intramedullar tumours of 78 cases, Sandalcıoğlu et al. indicated that 59 % of the cases were male and 41 % of them were female with an average age of 43.3 years. In their study, tumours were located in the cervical and cervicothoracic region (55 %), thoracal region (32 %) and the conus medullaris (13 %). Sandalcıoğlu emphasized the importance of preoperative neurological status, and also indicated that the postoperative morbidity risks of the thoracic tumours were relatively higher [4-6,19,23,28,29]. In our study, 38.6 % of the spinal tumours are intradural extramedullary tumours and all of them consist of meningiomas and schwannomas. Microsurgical gross total resection was done in 43 out of 46 cases with intradural extramedullary tumours (93.4 %) and neurological deterioration was seen in only one case. Overall, 10.1 % of all spinal tumours were of intradural intramedullary type. They were mainly (80 %) ependymomas and at a lesser extent (20 %) astrocytomas. It was established that 48 % of the cases were male and 52 % were female with an average age of 46.3 years and the tumours were located in the cervical and cervicothoracic region (38 %), thoracal region (32 %) and conus medullaris (30 %). Microsurgical gross total resection was performed in 10 out of 12 cases with intradural intramedullary tumours

(83 %). Neurological deterioration occurred in one operated thoracic case.

Most of the extradural tumours consist of metastatic tumours and the rarely of primer spinal tumours. The most common primary tumours are lung, breast, prostate, kidney, thyroid, gastrointestinal system cancers and lymphomas. Lung and prostate cancer is more common in males while breast and lung cancer are frequently encountered primary sources. The most common primary tumours in children are Ewing's sarcoma, neuroblastoma, osteogenic sarcoma, rhabdomyosarcoma, Hodgkin disease, soft tissue sarcomas, and germ cell tumours. It was established that the metastases were most commonly seen in the lumbosacral region and then at a lesser extent in thoracic and cervical regions. Extradural meningioma accounts for 2.7 to 10 % of spinal neoplasms and it is most commonly found in the thoracic spine [7]. Even if it occurs rarely, meningiomas should be considered in the differential diagnosis of extradurally enhancing masses.

Experimental study results show that, in the dorsal root ganglion (DRG) and spinal radicular artery (SRA), monopolar electrocautery (MEC) deteriorates these structures with thermic and electrical discharges and causes clinically severe autonomous motor and sensorial deficits which can not be diagnosed radiologically [3]. It was reported in the literature that the autonomic dysfunction in spinal tumour surgery caused constipation, urinary retention, ileus and neurogenic bladder [11,21,22,24-26]. In cases with neurological deficits, the status of the innervated autonomous organs should be evaluated preoperatively. Otherwise, in cases with pre-existing neurologic deficits, MEC might lead to septicemia, metabolic disorders or immunoparalysis and other serious complications. Defective autonomous innervation of organs such as liver, spleen, kidney might cause organ deterioration and many microbiological and biochemical complications might occur. Therefore, MEC usage should be avoided in spinal tumour surgeries.

Ensuring local blood flow is important for wound healing. Autonomous innervations, and DRG are responsible for the maintenance of local bölümood flow, and vasodilation. DRG damage increases the severity of the existing vasospasm in the arteries and reduces local blood flow, causing necrosis of the wound [13]. Only distal denervation pathologies are taken into account in spinal tumour surgeries. However, atrophy proceeding proximally may cause proximal atrophy of the ganglion and synapses, thus creating new neuropsychiatric problems [2]. We think that wound healing, clinical and radiological recovery would be better ensured in cases where MEC is not used. In cases of intramedullar tumours, preoperative spinal angiograms could be beneficial during surgery for the prevention of any potential vascular complications. The use of bipolar electrocautery should be preferred rather than MEC during both sub-periostal periosteal sharp dissection and intradural interventions.

Fusion should be avoided, as reoperation would be required because of ensuing frequent relapses or complications. Sometimes, reoperation may be performed because of a misdiagnosis [14]. Since spinal subdural hematoma and spinal subarachnoid hemorrhage are frequently disregarded in posttraumatic-postsurgical patients, these points should be considered. It should be kept in mind that, in cases with postoperative infection, a large incision may cause spongioma, and cottonoma etc. In cases where the dura was primarily sutured and dural closures were not used, the use of a non-vacuum drain will be beneficial in monitoring possible development of a liquor fistula. As in all operations where the dura is opened for the removal of intradural tumours, occasional complications such as pneumocephalus may occur. In our case, pneumocephalus was detected in an unconscious patient following

spinal tumour surgery. In particular, steroid treatment should be started in patients with severe postoperative neurological deficits or in the intradural tumours with frequent manipulations. During a surgical operation drains used, eliminates necrotic elements, thus reducing the risk of infection.

CONCLUSION

Zero bleeding control must be ensured during the tumour surgery, and gracile muscles should be dissected, while protecting periosteum, and cortex. Irrigation fluid should be used to normalize the body temperature and large dissections, local material use and facet denervation should be avoided. High voltage monopolar cautery should not be used, disintegrated tissues should not be left within the concerned area and the residue should be removed through hyperthermic coagulation instead of total resection. Proximal and distant metastases should be well sought for and histopathological analyses should be initiated to enable the administration of early radio-chemotherapy.

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