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Original

Spinal Meningiomas: report of 14 cases and literature review

Meningiomas Espinhais: relato de 14 casos e revisão da literatura

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ABSTRACT

Objectives and Introduction: *This study aims to present the cases and surgical outcomes of 14 cases of spinal meningiomas, along with an updated review of the medical literature of the disease. Spinal meningiomas are benign neoplasms that account for 25% to 50% of all intradural extramedullary tumors, and with a prevalence of up to 2:100,000/year, primarily affecting female adults. Treatment is primarily surgical.* ***Patients and methods:*** *We selected patients with diagnosis of spinal meningiomas, admitted in three different Brazilian hospital facilities from January 1995 to January 2014. Later, the cases were analyzed for age, clinical and neurological examination, neuroimaging studies, treatment, histopathological examination and prognosis.* ***Results and Conclusion:*** *Ten patients were female and four male with average age of 53 years. Pain was present in all patients; twelve patients (85%) had abnormal motor function in the lower limbs; paresthesia in eight (57%) and hypoesthesia in four (28%); sphincter changes in four (28%) and Brown-Sequard syndrome in one case (7%). Thirteen patients (92%) underwent laminectomy, and one patient (7%) was submitted to laminoplasty. During the follow-up sensory changes were present in six (42%), abnormal motor function in four (28%), urinary incontinence in two (14%) and neuropathic pain in one patient (7%). The extent of resection is considered the most important factor in determining the rate of recurrence. In this work, "en bloc" resection was possible in most of the cases. Recurrence risk in five years after total resection of the tumor was null, and in ten years was 13%. Spinal arachnoiditis is the most frequent complication in postoperative period, which has a poor prognosis.*

Key words: *Spinal tumors; Meningioma; Spinal canal; Treatment.*

RESUMO

Objetivo e Introdução: *O presente estudo tem como objetivo principal a apresentação dos casos e resultados cirúrgicos de 14 casos de meningiomas espinhais, e uma revisão atualizada da literatura médica sobre a doença. Os meningiomas espinhais são neoplasias benignas que respondem por 25% a 50% de todos os tumores intradurais e extramedulares, com prevalência de até 2:100.000 habitantes/ano, acometendo principalmente indivíduos adultos do sexo feminino. O tratamento é preferencialmente cirúrgico.* ***Pacientes e métodos:*** *Foram selecionados pacientes com diagnósticos de meningiomas espinhais, internados em três diferentes complexos hospitalares brasileiros no período de janeiro de 1995 a janeiro de 2014. Os casos foram posteriormente analisados quanto à idade, exame clínico e neurológico, exames de neuroimagens, tratamento, exame histopatológico e prognóstico.* ***Resultados e Conclusão:*** *Foram selecionados dez pacientes do gênero feminino e quatro do masculino, de média de 53 anos de idade. A dor esteve presente em todos os pacientes; doze pacientes (85%) apresentaram alterações motoras em membros inferiores; parestesia em oito (57%) e hipoestesia em quatro (28%); alterações esfincterianas em quatro (28%) e síndrome de Brown-Séquard, um caso (7%). Treze pacientes (92%) foram submetidos à laminectomia e um paciente (7%) à laminoplastia. No seguimento ambulatorial alterações sensitivas estavam presentes em seis (42%), alterações motoras em quatro (28%), incontinência urinária em dois (14%) e dor neuropática em um paciente (7%). A extensão da ressecção é considerada o fator de maior importância na determinação da taxa de recidiva. Neste trabalho, foi possível a ressecção em bloco na maioria dos casos. O risco de recidiva em cinco anos após a ressecção total do tumor foi nula, e em dez anos foi de 13%. A complicação mais frequente no pós-operatório é a aracnoidite espinhal que apresenta prognóstico reservado.*

Palavras-chave: *Tumores medulares; Meningioma espinhal; Canal espinhal; Tratamento.*

Introduction

Meningiomas are benign, slow-growing, well-circumscribed, extra-axial tumors, with a tendency to spread laterally into the subarachnoid space[28,55,63]. Spinal meningiomas account for 25% to 50% of all intradural and extramedullary tumors with a prevalence of 0.5 to 2:100,000/year[1,16,20,39,53,61,63]. The ratio between spinal and intracranial meningiomas varies between 1:2 and 1:16[22,31,41,59]. Meningiomas are tumors of adulthood and the elderly with the highest incidence between the fifth and seventh decades of life with a rare occurrence in childhood[13,20]. The relation of female to male cases ranges from 4:1 to 8:1[20,21,28,34,41,45,48,63,67,68,70]. Females in the childbearing age are more affected, due to a possible association in estrogen dependence[70]. The presence of hormone receptors

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for progesterone, androgens, prolactin and steroids have been demonstrated in these tumors[48,58]. There are reports on the association between progression of pregnancy and brain meningiomas, thus demonstrating the hormonal role in the development of these tumors. However, in relation to those located in the spinal column, the described frequency is lower, probably due to the emergence of these in older women[8]. Genetic studies show a complete or partial loss of chromosome 22 in half the cases of meningiomas with an also observed relation with genes 1p, 5p, 9p, 10q and 17q[2,20,34]. Approximately half the patients with type II neurofibromatosis present spinal tumors and, of these, 10% are meningiomas.

The most frequent site is the posterior, posterolateral or lateral thoracic region (64% to 84%), followed by anterior cervical (14% to 27%) and lumbar (2% to 14%)[9,67]. In comparison to the axial array approximately 40% are ventrolateral, 21% dorsolateral and 13% lateral. Extradural extensions are present in 5% to 6%. Atypical locations as intramedullary, epidural or extraforaminal are rare[17,30,35,43,51,54,66,69]. Usually located in the dorsal region with intradural extramedullary location, most of the cases are solitary tumors. They are considered mesodermal tumors that originate in the arachnoid cells next to nerve roots, with slow growth laterally to the subarachnoid space until the moment they become symptomatic[20,52]. Spinal meningiomas do not penetrate the pia mater due to the existence of intermediate leptomeningeal membrane, located between pia mater and the arachnoid, contrary to what occurs with intracranial meningiomas. The spinal meningioma is usually solitary, but there are reports of multiple cases associated with type II neurofibromatosis[31,39,47,50,62]. Histologically, the most common varieties in the spinal column are the psammomatous subtypes followed by meningoendotelial and transitiona[l9,18,20]. Some aspects may be in plaques or calcifications[6,15,18,32,42,65].

The differential diagnosis of spinal meningiomas consists of herniated disc, syringomyelia, osteoporosis, arthritis, Parkinson's disease and schwannomas[55,60]. They are clinically manifested through signs and symptoms associated with progressive myelopathy[39]. Radicular or spinal pain are the most common complaints, followed by motor disorders, and sensory, gait and sphincter changes[22,29,41,64]. The duration of symptoms is long, reaching more than a year in most cases[20,29,41,59,61]. The delay in diagnosis is more pronounced in elderly patients due to symptoms being attributed to pre-existing conditions as cerebral arteriosclerosis, parkinsonism, diabetic neuropathy, osteoarthritis, osteoporosis and pernicious anemia[25,27]. Magnetic resonance imaging (MRI) is the diagnostic test of choice, since it shows the location, extent, axial position and possible presence of associated injuries and vertebral malformations, edema or syringomyelic cavities[13,20,31,44-46,48,56]. In most cases the tumor images are isointense or hypointense on T1 in the spinal cord sequences and slightly hyperintense on T2 with large uptake of gadolinium, showing the dural tail and sometimes meningeal strengthening[4,10,33,49]. The presence of intratumoral calcifications can produce a dark signal in the image sequence in T2, and is best viewed with computerized tomography[6, 48]. Spinal meningiomas are less vascularized and present less intratumoral calcification in relation to intracranial meningiomas[52]. Selective arteriography has been used by Roux and collaborates to locate the anterior spinal artery and observe details of the tumor vasculature, particularly in those located anteriorly due to high surgical risk. Computed myelotomography is considered a complementary to MRI, especially to identify intradural tumors in the lower lumbosacral portion or in cases of tumors with intra and extradural affection, and is still used in cases where MRI is contraindicated[1,44,56].

Treatment of meningiomas consist in the surgical approach, with the primary objective to perform complete resection of the tumor, with a success rate ranging from 82% to 98% of cases[22,28,41]. The greatest technical difficulty depends on the axial location of the tumor, especially in cases located in the ventral portion, being sometimes necessary to section the dentate ligaments for their removal. The use of intraoperative ultrasound facilitates locating and reducing the opening of the dura mater[36]. Gambardella et al., in a series of ten cases of dorsal spinal meningiomas located in the anterior portion with a transpedicular-transacetabular combined approach, obtained positive results in 80% of cases. Misra and Morgan approached nine cases of spinal meningiomas located in the anterior portion and used several access with bone resections, some needing fixing and spinal stabilization. The technique of choice regarding tumor implantation has been discussed; those located posteriorly are possible to extract the tumor base and perform a restitution through dura mater, but in those ventrally located, such approach is difficult and many authors have done electrocoagulation. Additional radiation as adjuvant treatment in cases of partial tumor removal have been contraindicated by several authors[22,47].

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Patients and methods

We selected patients with confirmed diagnosis of spinal meningiomas who were admitted to the Service of Neurosurgery of Santa Casa de Misericordia in Ribeirão Preto, Service of Neurosurgery of the João Alves Filho Hospital (Aracaju - Sergipe) and the Department of Neurosurgery of the Clinical Hospital of the Federal University of Triângulo Mineiro, from January 1995 to January 2014. The cases were later analyzed by age, symptoms, neurological examination, neuroimaging, treatment, histopathology and prognosis.

Results

For this study, 14 patients were selected, with ten females (86%) and four males (14%). Ages ranged between 33 and 69 years, with an average of 53 years. Regarding the symptoms, pain was present in all patients; twelve patients (85%) had abnormal motor function in the lower limbs; paresthesia was present in eight (57%) and hypoesthesia in four (28%); sphincter alterations in four (28%) and Brown-Sequard syndrome in one case (7%). All patients were investigated by computerized tomography (CT) and magnetic ressonance imaging (MRI). In ten cases the neuroimaging studies showed thirteen tumors located in the thoracic and lumbar regions, being characterized as intradural extramedullary tumors, with an evident 'dural tail' sign. In 60% of cases the tumor was located at the T2-T8 level and in 40% between T10-T12, with a predilection for the T12 level. Thirteen patients (92%) underwent laminectomy, and one patient (7%) underwent laminoplasty. The surgical findings were predominantly well-defined, ovoid, fibroelastic lesions, which allowed, in most cases, their 'en bloc' resection. Histologically, it was found that six (42%) were of the psammomatous type, four (28%) were transitional, two (14%) were meningothelial type, one (7%) was fibrous and one (7%) had mixed histopathology (transitional / psammomatous). During the patients' evolution it was observed that five (35%) had full recovery. During follow-up sensory changes were noted in six (42%), abnormal motor function in four (28%), urinary incontinence in two (14%) and neuropathic pain in one patient (7%).

Discussion

Meningiomas are the second most common type of tumor of the spinal canal[63], only behind the nerve sheath tumors. In several papers a predominance of these tumors on women over men is demonstrated, a fact also reflected in this study, with 10 females and 4 males[20, 46, 59, 64]. Spinal meningiomas are rare in children and more common in elders, with the average age of the patients in this study being of 53 years, which is consistent with the findings of other authors[22,41,63,67].

The symptoms vary according to the size of the tumor and its location in the neuroaxis. Most patients present with radicular pain and motor changes, about half of them have sensory symptoms, and a third has a sphincter control deficit, and the average duration of symptoms is fourteen months[2]. In this article, all patients had pain, 12 of them had motor abnormalities, 8 had sensory changes and 4 had sphincter changes. The best diagnostic test is the magnetic resonance imaging (MRI). CT scan is also useful, and was the chosen imaging method for all patients in this study. Only four of them also underwent MRI. Spinal meningiomas are most commonly posterolateral lesions, and are more frequent in the thoracic spinal canal, as found in this series: 13 cases of thoracic location and only 1 case in the lumbar spine.

Surgery is the treatment of choice, and spinal meningiomas have a good prognosis in most cases. There are, however, some factors for post-surgical prognosis, including: the presence of neurological deficit, prolonged duration of symptoms, the patient's age and subtotal excision in surgery. The extent of the resection is considered the most important factor in determining the rate of relapse in both spinal and cerebral meningiomas[12]. 'En bloc' resection was possible in most cases in this article. Recurrence risk within five years after total resection of the tumor is null, and in ten years of 13%. The most frequent complication in the postoperative period is spinal arachnoiditis, which has an obscure prognosis[65]. Intraoperative mortality rate varies between 1% and 5.3%[41,45,63].

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