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SURGERY OF INTRAMEDULLARY TUMOR

Objective. *Intramedullary tumors are relatively rare, but majority of these tumors are benign and very often the surgical removal of the tumor may offer "cure' to the patients. Surgery of such lesion require a fine microsurgical technique. We would like to review some of the basic surgical principles share our results and complication.*
Methods. *Surgical exposure always reach the rostral and caudal pole of the tumor. The midline myelotomy is performed using a blade or microscissors. Pial (glial limiting membrane) tack-up sutures using 8-0 nylon are then placed at the myelotomy edges for gentle retraction. Except for hemangioblastoma, all tumor were done piecemeal using cusa. Generally, the goal of surgery is maximum tumor removal while preserving neurologic function. A combination of SSEPs, muscle MEPS, is important in guiding safe tumor resection.*
Result. *There were 35 surgical cases with intramedullary tumor (10F;25M), the mean age of presentation around 30-40 years. The pathologies are 15 ependymomas, 7 astrocytomas (1/7 anaplastic astrocytoma), 6 cavernomas, 5 hemangioblastomas, 1 glioblastoma multiforme, 1 tuberculoma. In term of location, 19 at cervical level, 10 thoracal, 4 thoracolumbal, 2 MO-upper cervical. Almost all cases experience decrease sensory with some spasticity, and improve over 6 months. Complete removal of 82% of case.*
Conclusion. *Surgery may offer a long term control or cure to majority of the tumors.*
Key Words: *Intramedullary tumor, ependymoma, astrocytoma, hemangioblastoma, cavernoma, tuberculoma, surgery, complications*

Epidemiology

Intramedullary tumors are relatively rare and comprise only 2-4% of all primary central nervous system tumors [1]. In adults, these tumors accounts for 25% of all intradural tumors, while in pediatric population in whom the incidence of meningiomas and schwannomas is low, it accounts for 80% of all intradural tumors [2.3]. Ependymomas and astrocytomas make up for 70-80% of all intramedullary tumors. In our series, ependymomas comprise the majority of these lesions 50% with the mean age of presentation around 30-40 years. In pediatric population, astrocytomas predominate (60%), with the mean age of presentation around 5-10 years [2]. Other less common lesions include hemangioblastoma, cavernoma, tuberculoma, teratoma [4], epidermoid [5], glioblastoma multiforme, metastasis [6], etc.

Intramedullary tumors can arise anywhere along the spinal cord. In our series, among the adult, the most common location is cervical and cervicothoracic region. Some reports mentioned that the most common location for adult patients are thoracal and conus region.

Ependymoma

Ependymoma contributes as one third of intramedullary tumor in adult population. In our series, there is no gender predilection with a mean age of presentation at 35-40 years, although some other reports reported a male predilection. Intramedullary ependymomas can occur anywhere in the spinal cord, although they have slight tendency to arise at the cervical region. Lesions are characteristically hypovascular, well circumscribed, and non-infiltrative to the surrounding cord tissue. They are often capped by a cyst over its rostral pole, and less frequently at its lower pole. Symptoms and signs are due to chronic compression of neural tissue. There are various histological subtypes, however, the most important feature that influences prognosis is anaplasia. Myxopapillary ependymomas are almost exclusively arise from the cauda equina and filum terminale [3].

Astrocytomas are more common in children than in adults. The two primary histological types are the diffuse fibrillary type and the pilocytic type [2, 3]. The pilocytic type is well differentiated and tends to be indolent, with a definable surgical plane, and is often associated with a large cyst. The diffuse fibrillary astrocytoma has an infiltrative nature to the normal cord, thus it is impossible to resect it completely. Residual tumor often has an indolent course, and controversy exists in the management of such tumors. Less than 10% of intramedullary astrocytomas are high grade (anaplastic astrocytoma or glioblastoma). These malignant tumors exhibit rapid growth, are locally invasive, and may seed through the CSF. Glioblastoma usually shows a rapid progression of symptoms, especially the motor function.

Hemangioblastomas account for 5-10% of all intramedullary tumors. Hemangioblastomas are highly vascular tumor that is associated with von Hippel-Lindau disease in 25%-30% of cases [3]. They are often associated with a cyst. The cyst wall itself is not lined with tumor cells. In patients with VHL disease, they often arise in multiple locations, thus findings of hemangioblastomas warranted imaging of the entire neuraxis. Removal of the lesion is considered curative, although in patients with VHL disease there's always a risk of developing new lesions.

Clinical Presentation and the Imaging

The clinical features of intramedullary tumors are variable and often indolent, with symptoms commonly precede diagnosis for 3-5 years. The pathology such

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as ependymoma and astrocytoma, usually only cause sensory changes with subtle motor weakness. Very often patient with such significant big tumor (Fig. 1 left) only presented with very mild sensory symptoms, some will describe it as 'uncomfort feeling' or numbness. The size of tumor is not the absolute aspect that define the patient clinical presentation. As a comparison, smaller-sized tumor could present with obvious motor weakness (Fig. 1 right)

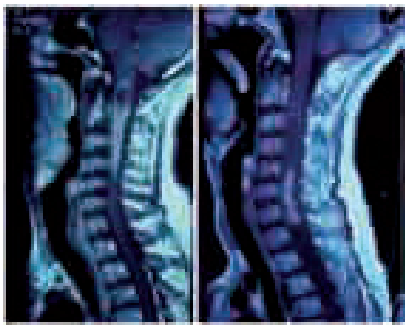

Figure 1 – left : A 53 years old male, who presented with one year history of numbness on both hands, and difficulty of doing fine movement such as doing button and signature. No obvious motor weakness.
Right: A 52 years old female, who presented with progressive weakness and numbness of all extremities. The tumor is smaller compared to the previous one but the syrinx exist above and below the tumor. In both cases, the pathology after surgery are ependymoma

The nature of neurologic deficits depends on the location of the tumors within the spinal cord and the progression of damage to the fiber tracts involved, the tumor size, the nature of the tumor growth rate, the spectrum of malignant behaviour, and the syrinx around the tumor. Altought it was reported in the literature that some tumor may present with an abrupt deterioration because of intratumoral bleeding such as the case with hemangioblastomas [2], but it is rare. The hemangioblastoma could presented with swelling cord, it might be related with high pressure flow in spinal cord veins. On the MRI, the swelling cord could be extensive (Fig. 2 right), but the hemangioblastoma itself is very tiny on MRI (fig. 2 left). It is probably because of the feeder-draining (arteriovenous) shunting causes the venous congestion. The role of edema promoting factor also have been mentioned [7], but it is unrecognized yet.

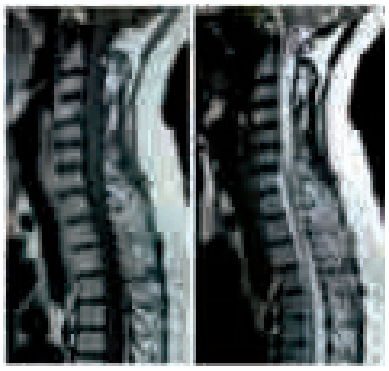

Figure 2 – A male 53 years old, who presented with progressive sensory changes (some part numb, and some part with mild burning sensation), motor power slightly weak (4+) and mild degree of spasticity. left : T1 with Gad, shows a tiny enhanced nodule at posterior cord on C2 level.
Right: an extensive swelling of the cord until C6-7 level

The swelling cord may represent the congested outflow of the interstitial fluid because of venous stasis and the venous compliance decreases. The blood from the feeder of the hemangioblastoma will drain in to the vein, causing higher pressure vein. Interstitial fluid that is supposed to be drained in to the vein, will be accumulated. The process could be similar with the pathogenesis of syrinx formation in chiary malformation. The congested fluid could further form small cysts that will condense become bigger cysts. If the cyst becomes big enough, then it will be called syrinx. (Fig. 3) As we could observe, the swelling cord always start and extend caudally from the lesion. The syrinx usually starts at the level below the lesion, then during valsava manuver (such as coughing, sneezing, lift ing heavy object, etc.) the syrinx will extend upward and downward.

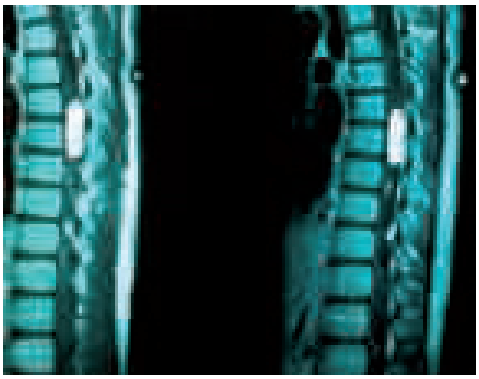

Figure 3 – A 21 years old male with progressive imbalance and numbness. The motor power of lower extremities were normal. T1 wighted image with Gad, shows a homogenous enhance lesion at T8-T9 level. Notice that the syrinx extend above and below the lesion. The pathology was hemangioblastoma

Axial spinal pain could be the earliest presenting symptoms. The pain is usually a deep, dull aching pain, could be radiating segmentally. Sometimes patient described it like a very tight band around the chest if the tumor located at the thoracal region. The pain often worse at night, and may awake the patient from sleep.

Due to their slow growth, intramedullary tumors may occasionally widen the spinal canal and erode the pedicles [2]. Scalloping of the vertebral bodies and scoliosis are also common [8].

Myelography was originally used to classify the location of the spinal tumors (intradural intramedullary, intradural extramedullary, and extradural). However with the advent of MRI, it is now rarely used and is used mainly when MRI is not available or not possible. Its sensitivity and specificity can be improved when combined with post myelographic CT.

MRI is the preferred modality for intramedullary tumors, and nowadays it is the only imaging necessary for initial work up. It could provide superb details of the spinal cord and the intramedullary lesions. Typically, most tumors are iso- or slightly hypointense on T1-weighted image, hyperintense on T2-weighted image including the edema dan cyst /syrinx. Gadolinium administration is important in defining the component of the tumors, and the enhancement could be homogeneous or heterogeneous.

Several MRI features may aid in distinguishing between the common types of intramedullary tumors.

Ependymomas tend to expand the cord symmetrically and focally as compared to astrocytomas, which are often more diffuse and eccentrically located. With gadolinium, ependymomas usually enhance more homogeneously with sharply demarcated mass, sometimes capped by a non-enhancing cyst. (Fig. 4) While infiltrating fibrillaryastrocytomas present as diffuse and non enhancing mass. MRI appearance of glioblastoma multiforme is sometimes very similar with intramedullary tuberculoma. Even the clinical features are very similar, but the response to the treatments are totally opposite between these two pathology.

Other disease can have MRI appearance similar to intramedullary tumors, such as tuberculoma, multiple sclerosis, transverse myelitis, sarcoidosis, and dural arteriovenous fistula (with massive cord edema). Tuberculoma imaging is somehow very similar with glioblastoma multiforme. Clinical history, neurologic examination, and consideration of differential diagnosis can help to avoid unnecessary or inappropriate surgery. Characteristically, tumors enlarge the spinal cord and show greater enhancement with contrast, while inflammatory lesions results in a normal or minimal increase in spinal cord size and the enhancement tend to be patchy and multiple. Flow voids are suggesting a vascular lesion. Spinal angiography can confirm this vascular entity.

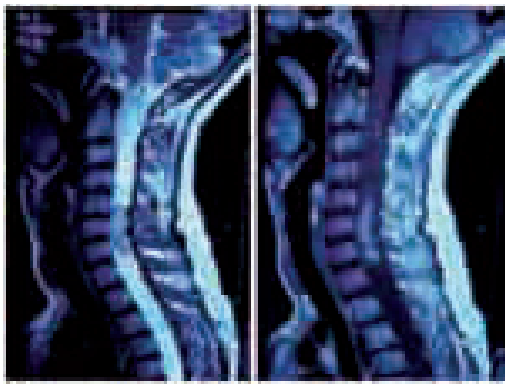

Figure 4 – a 52 years old female with progressive weakness and numbness on all extremities. She was wheel chair bound when she presented in clinic. Left : T2 weighted MRI showed isointense mass surrounded by syrinx. Right: T1 weighted images with contrast showed a contrast enhanced mass surrounded by the syrinx

Surgical Technique

Because most of these tumors are slow growing and locally contained, surgical resection is the treatment of choice. Preoperative counseling with patient and family is very important. They should understand the natural course of the disease, the indication for surgery and post operative rehabilitation. Patient should be informed that, certain pathologies such as ependymoma, hemangioblastoma, cavernoma etc, might be cured by surgical treatment. They also need to know that the surgical outcome is closely related to the preoperative neurological state. Patient that presented with wheel chair bound will most likely require wheel chair for their whole life, but those patients with mild sensory changes are most likely return to their preoperative motor function. After surgery, almost every patient will have some declining of their neurological function, but all will improve gradually through rehabilitation. They usually return to their preoperative neurological state, 3-6 months after surgery.

Prior to surgery, the preoperative antibiotics and steroids are routinely given. After induction of general anesthesia, the patient is placed prone on the operating table with bolsters under the chest and hip, paying attention to free the abdomen from pressure to minimize venous hypertension. All pressure points are appropriately padded. If the lesion is in the cervical or cervicothoracic region, the head should be fixated using a head holder. If the lesion is in the thoracic or thoracolumbar region, the head can be supported with a foam doughnut. Anesthesiologist should be made aware that intraoperative monitoring is crucial to the success of resection and should minimize agents that interfere with intra operative monitoring. Halogenated volatile anesthetics may interfere sensory evoked potentials (SSEPs), while paralytics interfere motor evoked potentials (MEPs). Normotension should be maintained throughout the surgery to prevent ischemic spinal cord injury. An arterial line is always needed to ensure that a drop in blood pressure is detected early and corrected immediately. During positioning, always make sure that the eyes are free from compression. It has been reported that, a drop in blood pressure and compression to the eyes might cause blindness as a remote complication [9].

Prior to incision, the lesion of interest should be localized using C-arm or plain radiograph to confirm the operative level. A standard posterior midline approach is used to expose the lamina and spinous processes. Wide laminectomy or laminoplasty is performed without compromising the facet joints in order to minimize the risk of spinal instability. The extent of the bony removal should be at least one level above and one level below the tumor. Exposure of the syrinx and cystic component is not necessary, as they usually resolve after complete tumor resection. After the dorsal duramater exposed, meticulous hemostasis is carried out by coagulating bleeders, waxing the laminectomy edges, and placement of moist cottonoids along the epidural gutters. A midline durotomy is then carried out, and the dural edges are tacked up to the soft tissues laterally, to prevent extradural blood entering the intradural space. Care is taken not to open the arachnoid with the dura, to prevent troublesome bleeding from the vessel on the surcafe of the cord. The arachnoid is then opened as a separate layer and tacked laterally to the dural edges using hemoclips.

The dorsal aspect of the cord should be inspected for any surface abnormalities, including discoloration of neovascularization. But the most important step to do is to observe and define the midline of the cord. Very often the midline is shifted to one side, because of the tumor in the cord. One of the key features to define the midline is the vascular pattern. The perpendicular vein is usually coming out from midline posterior. Defining the midline is very important because the approach to most intramedullary tumors usually through posterior midline myelotomy, between the dorsal columns. Occasionally, eccentric lesions such as cavernoma, may be approached through the dorsal root entry zone. Hemangioblastomas usually have pial presentation, with very specific 'orange red' colour (Fig. 6a) and can be approached from there.

The midline myelotomy is performed using a blade or microscissors. Small dorsal pial vein crossing the midline can be cauterized and divided. Pial (glial limiting membrane) tack-up sutures using 8-0 nylon are then placed at the myelotomy edges for gentle retraction. The myelotomy is extend superiorly and inferiorly with sharp knife or microscissor, following the midline. Usually the midline could be disected gently using no 5 or 7 Rhoton dissector.

The dorsal aspect of the tumor is then exposed, the myelotomy ideally should expose the rostral and caudal ends of the tumor. The pia tack-up will help to reduce manipulation at the edge of the myelotomy. The lesion can be entered to obtain specimen for frozen section to confirm pathological diagnosis. If the frozen section shows certain entity such as tuberculoma intramedullary, the surgery will come to an end.

Ependymomas typically are sharply demarcated from the surrounding normal cord tissue, and often surrounded by syrinx or cyst. The cleavage plane between the tumor and the surrounding cord can almost always be developed. Internal decompression is then carried out using a combination of ultrasonic aspirator, bipolar cautery, and suction. Adequate tumor debulking should be performed before removing the tumor at the edges. Combination of blunt and sharp dissection is used to infold the remaining tumor along its cleavage plane. Many tiny feeding vessels can be cauterized and divided. At its ventral attachment, usually there are substantial blood supplies from branches of anterior spinal artery. This should be carefully recognized and coagulated prior to cutting to prevent troublesome intramedullary hemorrhage. Such hemorrhage is very difficult to control without damaging the cord. (Fig. 5)

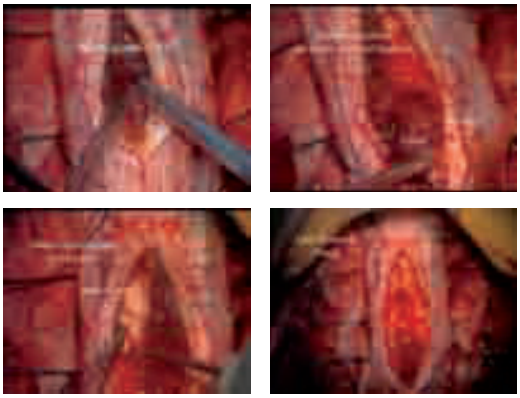

Figure 5 – A case with cervical ependymoma, upper left: debulking the tumor with gently powered cusa, notice that the pia tack-up with 8/0 nylon holding the myelotomy edge. Upper right: define the tumor and cord interface and following the interface as a plane. Lower left : developing cleavage between the tumor and surrounding cord. Extend the dissection by folding the tumor centripetally. Lower right: after total removal of the ependymoma

Astrocytomas often do not have clear cleavage plane, but they could have polar cyst usually at the inferior part. Aggressiveness with respect to resection depends on the histological diagnosis of a frozen section and the ability to find and maintain a surgical plane. Given the difficulty in determining many ependymomas from astrocytomas on frozen section, the presence or absence of a clear surgical plane is usually the key determining factor in defining the surgical goal. If, after analysis of all available data including imaging characteristics, frozen section, and intraoperative appearance, a diagnosis of ependymoma is perceived, a complete surgical resection should be attempted. If a diagnosis of astrocytoma is perceived, most clinicians advocate a more limited debulking of only the tissue that is clearly abnormal.

Hemangioblastoma, these vascular tumors should not be entered because they will bleed profusely. It usually appears dorsally with a pial presentation and are often associated with polar cyst. It is very important to define the feeding vessel and the draining vein. Small feeding vessels at the tumor cord interface are coagulated and cut while preserving the draining vein for the last moment. Using low power bipolar, slowly shrink the tumor and creating more space for dissection of cleavage plane. Hemangioblastoma always have a good cleavage plane. Anteriorly, branches from anterior spinal artery may provide major blood supply. Complete resection should be feasible in virtually all cases of hemangioblastomas.

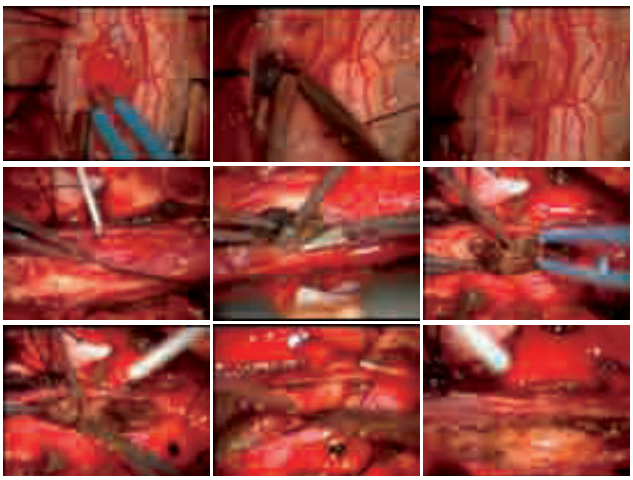

Figure 6 – small hamangioblastoma (a-c), a: the 'orange red' colour is typical for hemangioblastoma. Coagulate the feeding arteries and cut to isolate the tumor. b: leave the draining vein for the last moment. c: after complete removal, without piecemeal approach. Big hemangioblastoma (d-i), d: observe and coagulate the feeding vessel, e: define and develop the cleavage plane between tumor and cord interface, f: shink the tumor with gentle coagulation and irrigation, g: cut the tumors into pieces to make more room for dissection, h: coagulate and cut the vessels, i: after complete removal

Cavernoma can be notice by the discoloration of hemosiderin from previous bleed. The best time to do the surgery, when the cavernoma is surrounded by chronic blood (2-3 weeks after the onset of bleed). Low power coagulation will help to shrink the tumor and creating more space. Total removal of such lesion should be feasible in virtually all cases.

Tuberculoma, usually bloodless, is yellowish-gray in colour. It is soft especially at the central part. When the suspicious of tuberculoma take place, then the surgeon should wait for the quick section confirmation before doing more manipulation to the cord. It is not necessary to decompress such lesion. Once tuberculoma is confirmed, then the surgery is stopped. Such case will be followed by anti tuberculosis medication.

Generally, the goal of surgery is maximum tumor removal while preserving neurologic function. A combination of SSEPs, muscle MEPS, is important in guiding safe tumor resection. SSEPs measure the afferent conduction of impulses from the peripheral site up to the cerebral cortex. However, SSEPs are often reduced after midline myelotomy. MEPs estimate of the integrity of the motor pathways during surgical resection of the tumor.

With meticulous microsurgical technique, complete tumor removal is possible. The tumor bed is then inspected for oozing. Meticulous hemostasis is attained using irrigation and placement of oxidized cellulose.

Adjuvant Treatment

In many patients, complete resection of ependymomas is feasible, and radiotherapy is unnecessary. The management of ependymomas that are subtotally resected is still controversial. In one series, 30 out of 33 patients who had subtotal resection were irradiated. The 5- and 10-year survival rates were both 59% following radiotherapy [2].

The role of radiotherapy after surgery for intramedullary astrocytoma has not been clearly elucidated. Radiotherapy may not be required after gross total resection of lowgrade astrocytomas. It is generally accepted as an adjuvant therapy for high grades astrocytomas.

There is no role for adjuvant radiotherapy in the treatment of intramedullary hemangioblastomas and cavernomas because most of these lesions are resectable. Intramedullary tuberculomas usually respond well with antituberculosis medication. Combination of rifampicin, isoniazide, pirazinamide, ethambutol and streptomycin are necessary to treat the tuberculoma. The treatment is similar with other extrapulmonary tuberculosis. The treatment should be adequate, at least 6 and could be maintained to 12 months. The follow up MRI could be done every 3 months for evaluation.

Outcome and Prognosis

A significant number of patients developed new neurologic deficits immediately after surgery. However, in most of these patients, the symptoms are usually transient and will resolve over several weeks to months. Manipulation around the myelotomy site may cause loss of proprioception and induce spasticity. The spasticity is usually improves over several weeks to months. Severe preoperative neurological deficits and functional status is significantly associated with poor neurological outcome.

In relationship with tumor location, tumor that located in cervical cord region are doing relatively better, recover faster compare with the thoracal level. It is probably related with the size of the original cord. The smaller the cord, the more vulnerable it is.

The 5-year survival rate for patients with all grades of intramedullary astrocytomas is 50-60% [2]. Patients with pilocytic astrocytoma have higher survival rates (5-year survival of 80%) than those harboring high-grade lesions (5-year survival of 0-15%) [2]. Malignant astrocytomas are associated with relentlessly progressive course with average postoperative survival of 6 months in adults and 13 months in children [3]. Unlike astrocytomas, ependymomas are usually more amenable to complete resection, which often results in a cure. McCormick et al have shown that there was no evidence of recurrence in their case series during a mean follow up of 62 months [8]. Another retrospective series showed that total resection carries a higher 10-year survival (85-90%) than subtotal resection (80%) or biopsy (25%) [2].

For hemangioblastomas and cavernomas, complete surgical resection of sporadic cases is usually curative. Patients with VHL are of course always at risk of developing new lesions and must have their entire neuraxis imaged periodically.

Tuberculoma usually do well, even if the patient comes with tetraplegic condition. Adequate treatment and agressive rehabilitation will help to improve their motor function. Most cases, the motor function will improve over 8-12 months.

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ТҮЙІНДЕМЕ

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ИНТРАМЕДУЛЛЯРЛЫ ІСІКТЕРДІҢ ХИРУРГИЯСЫ

Мақсаты. Интрамедуллярлы ісіктер салыстырмалы түрде алғанда сирек кездеседі, бірақ осы ісіктердің көбісі қатерсіз ісіктер және ісікті хирургиялық жолмен алып тастау көбіне науқастың толық жазылып кетуіне әсер етеді. Осындай зақымданудың хирургиясы нәзік микрохирургиялық техниканы қажет етеді. Біз негізгі хирургиялық принциптердің ішінен кейбірін қарастыруды, қол жеткізген нәтижелеріміз бен кезіккен қиыншылықтар туралы бөлісуді жөн көрдік.

Әдістері. Хирургиялық ену жолы барлық уақытта ісіктердің ростральды және каудальды полюстарын ашуға мүмкіндік беруі керек. Скальпель немесе микроқайшының көмегімен ортаңғы миелотомия жүзеге асырылады. Жұмсақ тракция үшін пиальды (глиальды шекаралы мембрана) қабықшаға миелотомия жиектеріне ұстағыштармен тігістер салынады, 8-0. нейлон қолданылады, гемангиобластомадан басқа ісіктердің барлығы кавитациялық-ультрадыбыстық хирургиялық аспиратордың қолданылуымен кезең-кезеңімен алынып тасталды. Операцияның мақсаты неврологиялық функциялардың сақталуымен ісікті барынша алып тастау болып табылады. Соматосенсорлық шақыртылған потенциал мен бұлшық еттің моторлық шақыртылған потенциалдарының үйлесуі ісікті қауіпсіз алып тастауда үлкен мәнге ие.

Нәтижелері. Интрамедуллярлық ісіктері бар 35 хирургиялық жағдай қаралды (10 әйел; 25 еркек), орташа жасы 30-40 жас. Гистологиялық – 15 эпендимомалы, 7 астроцитомалы (1/7 атипиялық астроцитома), 6 каверналы гемангиомалы, 5 гемангиобластомалы, 1 глиобластома, 1 туберкулема. Орналасуы: 19 мойын деңгейінде, 10 кеуде бөлігінде, 4 кеуде-бел аумағында, 2 МО-жоғарғы мойын бөлімінде. Операциядан кейінгі кезеңдегі барлық дерлік жағдайларда кейбір спастикалық сезімталдылықтың төмендеуі байқалды, симптоматика регресі 6 ай ағымында орын алды. Ісікті түбегейлі алып тастау 82% жағдайда жүргізілді.

Тұжырым. Хирургиялық емдеу көп жағдайларда ісіктің өсуін барынша бақылауда ұстауға немесе түбегейлі алып тастауға мүмкіндік береді.

Негізгі сөздер: Интрамедуллярлы ісік, эпендимома, астроцитома, гемангиобластома, кавернома, туберкулема, хирургия, асқыну.

РЕЗЮМЕ

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ХИРУРГИЯ ИНТРАМЕДУЛЛЯРНОЙ ОПУХОЛИ

Цель. Интрамедуллярные опухоли относительно редки, но большинство из этих опухолей являются доброкачественными и очень часто хирургическое удаление опухоли может привести к полному излечению больного. Хирургия такого поражения требует тонкой микрохирургической техники. Мы хотели бы рассмотреть некоторые из основных хирургических принципов, поделиться своими результатами и трудностями с которыми столкнулись.

Методы. Хирургический доступ всегда должен позволять открыть ростральный и каудальный полюса опухоли. Осуществляется срединная миелотомия с помощью скальпеля или микроножниц. Для мягкой тракции накладываются швы держалки по краям миелотомии на пиальную (глиальная пограничная мембрана) оболочку, используют нейлон 8-0., все опухоли, кроме гемангиобластомы, были удалены поэтапно, с использованием кавитационно-ультразвукового хирургического аспиратора. Как правило, целью операции является максимальное удаление опухоли с сохранением неврологических функций. Сочетание соматосенсорных вызванных потенциалов (ССВП), мышечных моторно вызванных потенциалов (МВП), играет важную роль в безопасном удалении опухоли.

Результаты. Рассматривалось 35 хирургических случаев с интрамедуллярной опухолью (10 женщин; 25 мужчин), средний возраст 30-40 лет. Гистологически – 15 эпендимом, 7 астроцитом (1/7 атипическая астроцитома), 6 кавернозных гемангиом, 5 гемангиобластом, 1 глиобластома, 1 туберкулема. Локализация: 19 на шейном уровне, 10 грудной отдел, 4 грудопоясничный отдел, 2 МО-верхне шейный отдел. В послеоперационном периоде почти во всех случаях отмечалось снижение чувствительности с некоторой спастичностью, регересс симптоматики наступал в течении 6 месяцев. Тотальное удаление опухоли отмечено в 82% случаев.

Заключение. Хирургическое лечение позволяет в большинстве случаев достигнуть хорошего контроля роста либо тотального удаления опухоли.

Ключевые слова: Интрамедуллярная опухоль, эпендимома, астроцитома, гемангиобластома, кавернома, туберкулема, хирургия, осложнения.