

"PERCUTANEOUS TREATMENT OF SPINAL HEMANGIOMAS USING THE VERTEBROPLASTY METHOD"

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ABSTRACT

The experience of the operations performed during this time shows that filling the hemangioma with bone cement stops further tumor growth, reliably stabilizes the body of the affected vertebra and provides a clinical effect, which is manifested by regression of the pain syndrome. PVP can be performed both before and after radiation therapy. It does not exclude, but complements other methods of treating spinal hemangiomas. [3]. Despite the great popularity of PVP method in various countries and the sufficient period of its application, the issues of choosing puncture accesses at different levels and with different localizations of hemangiomas in the vertebra, advisability of using bilateral accesses still remain deft, and how to calculate the amount of cement necessary for filling the body of the affected vertebra has not been defined yet. In the Republican Scientific Center of Neurosurgery and RSCN In the neurosurgery department of the Khorezm branch using the PVP method in 2016-2024, 89 patients (58 women and 31 men) aged from 21 to 69 years with aggressive spinal hemangiomas were operated on. All patients underwent a comprehensive examination, including spondylography, CT, MRI, MSCT. The indications for PVP were signs of aggressiveness of hemangiomas, progressive development of clinical and radiological symptoms, as well as MRI data. During the surgery, venous spondylography was performed to visualize the venous outflow collectors. At the mid- and lower cervical level (CIII - CVII), the access of choice is anterolateral part.

Based on large number of experimental works on the biomechanics of the spine and clinical material, it was found that to stabilize the vertebral body and relieve pain, introduction of 3 ml of bone cement is enough.[5, 10]. The maximum volume of bone cement in the treatment of aggressive spinal hemangiomas is determined according to the data of visual control using an intraoperative electron-

optical image intensifier. Transpedicular puncture access is the access of choice in the treatment of aggressive hemangiomas of the spine by PVP, localized in the thoracic and lumbar regions, and anterolateral - with the localization of hemangioma in the cervical region.

KEY WORDS: lumbar regions, transpedicular puncture, treatment, aggressive spinal hemangiomas, percutaneous vertebroplasty(PVP), different localizations.

INTRODUCTION

The results of surgical treatment of 89 patients with aggressive hemangiomas were analyzed. Specific features of the technique and anatomical substantiation of puncture accesses used in their treatment by percutaneous vertebroplasty are described.

35 years have passed since the advent of the method of percutaneous vertebroplasty (PVP) and its use in the treatment of spinal hemangiomas. So-called aggressive hemangiomas are of surgical interest, they occur in 3-4% of cases of the number of detected hemangiomas, which are potentially dangerous by narrowing of the spinal canal as a result of hypertrophy of the affected bone, epidural spread of the soft tissue component of the tumor, compression fractures of affected vertebral bodies, extradural hematomas due to hemorrhage from tumor tissue and medullary is chemia as a result of steal syndrome [2, 9]. The experience of the operations performed during this time shows that filling the hemangioma with bone cement stops further tumor growth, reliably stabilizes the body of the affected vertebra and provides a clinical effect, which is manifested by regression of the pain syndrome. PVP can be performed both before and after radiation therapy. It does not exclude, but complements other methods of treating spinal hemangiomas. [3]. Despite the great popularity of PVP method in various countries and the sufficient period of its application, the issues of choosing puncture accesses at different levels and with different localizations of hemangiomas in the vertebra, advisability of using bilateral accesses still remain deft, and how to calculate the amount of cement necessary for filling the body of the affected vertebra has not been defined yet.

According to R.S. Sherman (1961) and J.P. Nguyen (1989), the most common place of hemangiomas localization is the thoracic spine (in 76% of cases), less often they are localized in the lumbar spine (21%). One vertebra is affected in 77.5% of cases, multiple lesions are from 10 to 15.5% [5, 6, 7, 10]. As a rule, firstly hemangioma affects the vertebral body, spread of the tumor into the epidural space and compression of the spinal cord are secondary [2, 9].

The purpose of the study is to improve the results of surgical treatment of patients with aggressive spinal hemangioma by choosing the optimal access to percutaneous vertebroplasty.

MATERIALS AND METHODS

In the Republican Scientific Center of Neurosurgery and RSCN In the neurosurgery department of the Khorezm branch using the PVP method in 2016-2024, 89 patients (58 women and 31 men) aged from 21 to 69 years with aggressive spinal hemangiomas were operated on. All patients underwent a

comprehensive examination, including spondylography, CT, MRI, MSCT. The indications for PVP were signs of aggressiveness of hemangiomas, progressive development of clinical and radiological symptoms, as well as MRI data. During the surgery, venous spondylography was performed to visualize the venous outflow collectors. According to our data, in 65% of patients, hemangiomas were localized in the thoracic spine, in 32% in the lumbar spine (figure), and in 3% in the cervical spine. According to the topographic classification of hemangiomas by J.P. Nguyen et al. [10], the first type was 29%, the second - 46%, the third - 25%. In 2 patients, the soft tissue component of the tumor spread intracranially with the corresponding neurological symptoms of compression of the spinal cord and roots.

RESULTS AND DISCUSSION

Knowledge of the features of the microsurgical anatomy of the spine and paraspinal structures allows for various puncture accesses at all levels, preferring safer and more effective. The presence of a transpedicular stabilizing structure at the level of the lesion is not a contraindication and does not create technical difficulties for the conduct of PVP [6].

For the treatment of patients, a combined surgical intervention was used, combining PVP and open surgery aimed at removing the soft-tissue component of the tumor, located intracranially. During surgical interventions, the following puncture accesses were used: at the lumbar level - transpedicular (in 22) and open- vertebroplasty (in 5); at the level of thoracic spine - transpedicular (in 56); at the cervical - parapharyngeal (6). The volume of bone cement injected ranged from 1.5 to 5.0 ml (an average of 3.5 ml).

Transpedicular access involves the puncture of the vertebral body through the root of the arch. It can be one- or two-sided. The latter is advisable to use when spreading hemangioma to both halves of the vertebral body. An interesting fact is that patients whose PVP was produced by bilateral transpedicular access did not note any pain when injecting bone cement, and this can be explained by the creation of conditions for this access that prevent an increase in intraosseous pressure. Theoretically, these same conditions should help reduce the risk of possible embolic complications.

The popularity of transpedicular access is due to the peculiarities of the microsurgical anatomy of the thoracic and lumbar spine. The thickness of the cortical layer of the arches of the thoracic and lumbar vertebrae is approximately the same, with the exception of the middle thoracic spine, the arches of which have a thicker cortical layer. The inner cortical layer of the arches is 2/3 times thicker than the outer layer [8]. Due to this anatomical feature, when installing a transpedicular structure, a fracture is possible, which often occurs in the outer wall of the arch. [10]. To exclude similar complication with transpedicular puncture access, it is necessary to monitor the correspondence of the arch diameter and the caliber of the used needle. For this purpose, spondylograms are produced in the antero-posterior projection, on which the image of the oval of the root of the arch corresponds to its narrow waist, the size of which determines the size of the arch [4]. In general, the size of the arches tends to decrease from T1 to TV and gradually increase from TIV to TV vertebrae. The average height and width of TIV, TVIII and TXII arches are 10.4 and 3.7 respectively; 11.2 and 4.8; 15.2 and 8.7 mm. The length of the arches in the thoracic region increases gradually from T1 to TX and then slightly decreases to TXII [6].

THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

VOLUME-5, ISSUE-2

Knowledge of these anatomical features allows selecting a needle for PVP. For transpedicular puncture access to thoracic vertebrae with small arches (TIII-TIV), 13-K needle is used or for safety reasons it is necessary to use another access.

The spatial orientation of the arches is described in two planes. The transverse angle is formed at the intersection of the line drawn through the center of the arch and the line parallel to the spinous processes. It tends to decrease from T1 (30°) to T12 (10°) vertebra. Changes in the sweep angle are devoid of a similar sequence [6]. When carrying out puncture access, constant intraoperative image intensifier control is a prerequisite, however, knowledge of the above anatomical features can reduce the time of surgical intervention and reduce the radiation exposure to the patient and staff.

Features of the thoracic spine is that the medial wall of the arch is located next to the spinal cord and the distance between the exit of the root and the spinal cord is 2-4 mm [7]. Ignorance or underestimation of these anatomical features of the thoracic spine can lead to damage, compression of the nerve, rupture of the dura mater with subsequent liquorrhea, which was mentioned in the literature as complications arising from the installation of transpedicular stabilizing structures. However, these complications are also possible with transpedicular puncture access, if you make a mistake when choosing the entry point, the wrong direction of the needle advance, and the discrepancy between the size of the arches and the diameter of the used needle. Due to the peculiarities of microsurgical anatomy of the thoracic and lumbar spine, transpedicular puncture access is the access of choice when performing PVP at these levels.

The reserve puncture access at the lumbar level is the posterolateral one, which, as a rule, is used when it is impossible to perform transpedicular access. The entry point with the posterolateral approach is 6-14 cm from the line of the spinous processes, depending on the level of the vertebra of interest and the patient's constitution. The needle is advanced to the vertebral body retroperitoneally, bypassing the transverse process. Weaknesses of access are: the possibility of nerve damage, increased traumatization of paraspinal soft tissues due to the elongation of the wound canal, as well as the likelihood of retroperitoneal bleeding. In our practice, this access was used in one patient, the arches of the vertebra of which were destroyed by a hemangioma.

On the thoracic spine, intracostopedicular puncture access can be used, at which the point of needle injection is determined by the intersection of two lines: the 1st line is drawn paravertebrally at a distance of 5-7 cm from the line of spinous processes, the 2nd line - in the horizontal plane 1 cm below the spinous process of the overlying vertebra in the lower thoracic spine, 0.5 cm - in the upper thoracic spine. In this case, the needle must be moved deep into the soft tissues at an angle of 30-40° to the sagittal plane and 70-80° - to the horizontal plane. The depth of immersion of the needle is 7-9 cm. The needle passes along the base of the triangle, the sides of which are the transverse process, the arch plate and the rib section to the costotransverse joint. With this puncture access, it is possible to do vertebroplasty of the vertebral body even if a transpedicular stabilizing system is installed at the level of interest. [3] In intracostopedicular access, the angle of entry of the needle into the vertebral body is sharper than in transpedicular access, especially this is clearly seen at the upper thoracic level, where the arches are located almost parallel to the spinal cord. If the hemangioma extends to the entire body of the upper thoracic vertebra or occupies its anterior third part, then vertebroplasty requires either bilateral transpedicular access or intracostopedicular access, in which a sharper angle of entry of the needle into the vertebral body allows vertebroplasty of the opposite half of the vertebral body.

THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

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On the cervical spine, the following puncture accesses are used: transoral, anterolateral and posterior. Due to the small size of the arches of the cervical vertebrae, proximity of the location of the vertebral artery, spinal cord and nerve roots, transpedicular puncture access on the neck is very difficult technically and has a high degree of risk.

However, in literature [7] there are isolated reports of the use of this access for vertebroplasty of the cervical vertebrae. Transoral access can be used for PVP bodies of CII and CIII vertebrae. The anatomical justification for this access is the proximity of the location of the pharynx and the bodies of the SI, SS vertebrae, reducing the likelihood of damage to nearby anatomical structures.[10]. The weaknesses are the need for general anesthesia and the use of a special retractor that expands the oral cavity without injury to the teeth, as well as low level of sterility during the manipulation.

At the mid- and lower cervical level (CIII - CVII), the access of choice is anterolateral part.

Based on large number of experimental works on the biomechanics of the spine and clinical material, it was found that to stabilize the vertebral body and relieve pain, introduction of 3 ml of bone cement is enough.[5, 10]. The maximum volume of bone cement in the treatment of aggressive spinal hemangiomas is determined according to the data of visual control using an intraoperative electron-optical image intensifier.



Hemangioma of VL3 vertebral body: a - MRI of the lumbar spine; b - R-scopy after transpedicular percutaneous vertebroplasty.

a

b

There were no complications during the performed surgical interventions. The intensity of the pain syndrome, assessed by the visual analogue scale (VAS), immediately after the operation decreased by an average of 60%. In 2 patients in the postoperative period, there was a short-term hyperthermia up to 38 ° C, which was stopped without drug treatment, it was regarded as a reaction of the body to bone cement. The average length of patients stay in the hospital was up to 1.5 days. According to follow-up data (observation period is 1.5 years), all patients retained their ability to work and returned to their previous labor activity.

When analyzing the results of surgical treatment, on average, 10-14 days after the operation, it was found that all 89 (100%) patients managed to achieve good results according to Karnofsky score. Evaluation of the nearest results on Karnofsky score indicates positive effect of surgery on the health and well-being of most patients.

CONCLUSION

Transpedicular puncture access is the access of choice in the treatment of aggressive hemangiomas of the spine by PVP, localized in the thoracic and lumbar regions, and anterolateral - with the localization of hemangioma in the cervical region.

To reduce the risk of epidural spread of bone cement and embolic complications before vertebroplasty, venospondylography is mandatory, which allows visualizing venous collecting pools and, taking them into account, correcting the position of the needle. The needle bevel is set perpendicular to the plane of arch laminae.

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