

PLASTIC OPERATIONS UNDER METASTATIC TUMORS IN CERVICAL SPINE

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The main purpose of plastic operations under metastatic tumors in cervical spine is an improvement of life quality of the patients with metastatic tumors of the spine.

This work analyses the results of treatment of 104 patients. After decompression of spinal cord, their cervical vertebrae bodies were replaced with carbon implants and «CollopAn» materials. «CollopAn» does not have neurotoxic effects and has no impact on regress of myelopathy in postoperative period. The material has osteoinductive and osteoconductive nature and is a matrix for the newly formed bone. Due to the mentioned nature, in all cases, formation of bone-carbonic block was achieved without using osteoplasty. Reliability of bone – carbonic block was confirmed by long-term results of treatment of 49 patients with catamnesis for more than 5 years.

Keywords: metastatic tumors, spinal, decompression, CollopAn

Metastatic tumors in cervical spine are often observed among people at the age of over forty. Among those who suffer from breast and lung cancer, 76–85% of patients could have metastatic lesions of the spine, and among them 70–80% have pain syndrome which is difficult to treat and is one of the most important factors causing worsening of life's quality [2, 3, 8, 12].

Due to development of anterior approach, plastic operations have been widely adopted in treatment of cervical spine tumors. This approach provides broad exposure of vertebrae bodies, allows transcorporeal decompression of spinal cord with a subsequent reconstruction of front backing column and solid spine fusion [1, 10, 12]. Osteoplastic method of cervical vertebrae replacement, which has widely been used in practice, requires a long – term immobilization of neck in postoperative period before bone transplants restructuring is completed [2, 4, 8].

Early rehabilitation with permitted load on cervical spine for this method of reconstruction is fraught with migration or resolution of transplants with formation of kyphotic deformation of the spine. Application of metal structure in combination with an osteoplasty reduces a risk of the similar complications, but not rule them out, including a migration of retainer itself. Methods of reconstruction of vertebrae bodies with porous material (ceramics, nickelid-titan) are known. This material has abilities for germination in it of bone tissue [3, 5, 6, 7, 11, 13]. Since the process of germination of bone into implant is long, possible early rehabilitation of the patients with the use of mentioned implants is questionable. Besides, after extended resection of vertebrae bodies, the implant contacts with the bone mainly in butt segments, which also has negative effect on formation of block bone – implant.

Material and methods

Material for this study was clinical observations over 104 patients who had been under treatment in clin-

ics from 1998 to 2008. The patients were performed surgery on front decompression of spinal cord with replacement of vertebrae bodies.

Indication for operation was an existence of metastatic tumor of cervical spine. Myelopathy was symptomatic in different degree, but mostly observations of pareses were prevailed ($n=92$ patients). There were 12 paralysis – related cases and 7 patients had problems with malfunction of pelvic organs. According to Frankel classification, the patients of this group by severity of neurological status are divided into the following grades: A – 10, B – 37, C – 27, D – 30. The group under study includes the patients with decompression of spinal cord on two spinal segments with body replacement of one vertebra. Mobile segments (C4 – C5 and C5 – C6) of many patients were exposed to stabilization. We used the following method to replace the body of vertebra. Grooves were made in the bodies of stabilized vertebrae, which were filled with bone cement for 2/3 of volume. Then, carbon implant made of «Ostek» material was inserted into the grooves.

The implant functions as a fixer for operated vertebral segments and occupies a half of bone defect in the spine. Residual cavity is loosely tamponed by «CollopAn» granules. Front longitudinal ligament is tightly sutured to prevent granule migration. «CollopAna» material has osteoinductive and osteoconductive features, so we used it as a matrix one for a newly formed bone and forming of bone – carbonic block of stabilized vertebral segments. It is to be mentioned that we used domestically produced materials «Ostek» and «CollopAn» which have been developed by the research institute «Grafit» and «Intermedapatit» company, correspondingly. The used method of the spine body replacement meets the requirements of initially stable spinal fusion and allows an early rehabilitation of the patients in postoperative period, without ortez. We recommended our patients to use ortez when they use transport vehicle or when they are in situation with a risk of recurrent trauma of neck. In postoperative period, along with an assessment of neurologic status, X-ray has been done monthly. Besides, 42 patients have been observed to check the process of forming a newly formed bone with an assessment of bone tissue density by Hounsfield scale.

All the patients have been under regular medical check-up with monthly observation before bone – carbonic block was formed and regress of neurologic complications was developed. Long – term results (1 year after the operation) have been studied in respect of 95 patients. 9 patients were foreigners, so could not assess their

long – term results. When more than 5 years passed after the operation, the treatment results were observed in respect of 49 patients.

Results and discussion

Adequate decompression of spinal cord and reliable stabilization of the operated vertebral segments with an active rehabilitation in nearest period of time after operation have promoted regress of myelopathy. Besides, in most cases, an early activation of the patients allowed to avoid hypodynamic complications in nearest postoperative period. Totally, in 0,5% of observations (2 patients) hypoventilation pneumonia was confirmed. This complication was successfully treated and had no any effect on the results of the operation.

In one observation, we encountered an early bleeding and formation of haematoma in retropharyngeal space. This complication required surgical revision to remove haematoma. This complication had no any affect on the results of treatment. We did not find any specific local and general complications from application of «ColljAn». Besides, no wound infection was observed, including the patients with nonspecific spondylitis. To a certain extent, we attributed an absence of wound infection to application of «CollopAn». The material was impregnated with a broad spectrum antibiotic, which is slowly absorbed and used as an depot antibiotic for 3 weeks. «CollopAn» does have neurotoxic action and has no impact on the regress of myelopathy. The regress of myelopathy begins in the nearest postoperative period, reaches the peak during 2 months and finishes, on average, after 3 months when the operation is done.

Formation of the bone – carbonic block of the operated vertebral segments was completed in all observations. Formation of the bone – carbonic block does not depend on a type of pathology of the cervical spine. Replacement of the bone tissue by «CollopAn» is done with the same intensity both in case of patients with injury and those who have inflammatory or cancer destruction of vertebrae bodies. An average period of formation of the bone – carbonic block in this group of patients was 10 weeks. We did not mention any features in the process of formation of new bone. By using X-ray examination, it was confirmed that formation of new bone was completed after 4 weeks of postoperative period. After 4 weeks of the operation on replacement of C6 vertebra body, formation of the bone – carbonic block was observed (Fig. 1) and after 10 weeks – completion of the bone – carbonic block formation was observed (Fig. 2).

However, it is confirmed by computer densitometry that density of the newly formed bone in this period is low. The density of the newly

formed bone does not exceed $600 \pm 3,5$ H by Hounsfield scale and has 400 units less to reach the density of a spongy bone of the healthy vertebrae. With the course of time, the density of the newly formed bone rises and, on the average, in 10 weeks becomes equal to the density of healthy bone (Fig. 1, 2). Computer densitometry confirms the results of plan radiography, since the density of the newly formed bone almost equal to the healthy sections ($-959 \pm 3,5$ H). It is to be mentioned that bone – carbonic block was formed under conditions when load on cervical spine was retained. We did not mention the correction loss of the broken statics of the spine. The achieved orthopedic effect of the operation promoted the regress of clinical presentations of myelopathy. In most cases, complete regress of motor, sensory and reflex disturbances was confirmed (72 patients). Partial regress of myelopathy was observed in case of 30 patients. Two patients with cervical osteochondrosis did not show positive dynamics of neurologic status, in spite of adequate decompression of spinal cord and formation of bone – carbonic block. Apparently, in these observations ischemic nature of the cervical myelopathy prevailed. Assessment of neurologic status of the patients by Franckel shows obvious results of the treatment: A – 2, B – 5, C – 10, D – 7, E – 80 of the patients. So, after operation most patients (97 patients) recovered their health for an active life. And only 7 patients needed care. Reliability of the achieved effect of the treatment was assessed by the results of examination of 95 patients after 1 year of postoperative period. Analysis of the results showed that in all observations formation of bone – carbonic block was completed. No recurrence of kyphosis, destruction of healthy vertebrae or migration of carbon implant were observed. Overvalue of neurologic status was not mentioned. The treatment results of 49 patients have been observed with catamnesis for more than 5 years. Clinical and X-ray examination confirmed reliability of the proposed method of reconstruction of the vertebrae bodies.

By density, newly formed bone matches bone tissue of healthy vertebrae. Formation of bone – carbonic block is confirmed and there are no any signs of secondary kyphosis on the operated areas.

Conclusion

Analysis of the results of treatment shows that there is an ample opportunity for the use of «CollopAn» in plastic operations on cervical spine. «CollopAn» does not have neurotoxic effects and has no impact on regress of myelopathy after transcortical decompression of spinal cord. If stable spine fusion is achieved by carbon implant due to osteoin-

ductive and osteoconductive nature of «Collo-pAn», the material is transformed into the bone tissue with formation of reliable bone-cartonic block. This block is being formed at the time when loading on the cervical spine is retained. Due to impregnation of the material with broad

spectrum antibiotics, the risk of wound infection has been reduced, including the patients with nonspecific spondylitis. Long-term results of treatment confirm strength of the formed bone – cartonic block without secondary kyphotic deformation of the spine.



Fig. 1



Fig. 2

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