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## **ADEQUATE APPROACH TO THE DIAGNOSIS AND SURGICAL TREATMENT OF PATIENTS WITH OSTEOPORTIC FRACTURES OF THE VERTEBRAL BODIES**

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### **Abstract.**

Vertebral fractures due to osteoporosis are a significant medical and socio-economic problem. Puncture vertebroplasty is an effective type of treatment for vertebral fractures and relief of pain associated with osteoporosis. Adequate conservative treatment of osteoporosis in the postoperative period slows down the progression of this disease and reduces the likelihood of new fractures of the spine in the complex treatment of this disease.

**Key words:** Osteoporosis, percutaneous vertebroplasty, bone cement.

### **INTRODUCTION**

The concept of vertebroplasty began to exist in clinical practice since the 70-80s of the last century as an open surgical intervention, in which bone cement was injected to strengthen the vertebral bodies before installing stabilizing systems. Some surgeons used this method to fill the empty space after resection of the vertebral body tumor (Akhmedov Sh.Ch., 2017).

Percutaneous vertebroplasty was first performed in 1984 by Drs. Galibert and Deramond at the Department of Radiology at the University Hospital of Amiens, France, on a 54-year-old woman with an aggressive C2 vertebral hemangioma. Later, PVP was performed for vertebral osteolytic metastases and secondary collapse of the vertebral body against the background of osteoporosis (Abakirov M.D., 2017).

Many clinical studies have shown a significant regression of pain symptoms in approximately 90% of cases with osteoporotic compression fractures (Makirov S.K. et al., 2016).

Despite the positive results of using the PVP method in patients with spinal osteoporosis, there are still some unresolved and controversial issues.

The conditional amount of cement intended for injection is presented in accordance with the department of the affected spinal column and the degree of compression of the vertebral body (Zaretskov V.V. et al. 2011).

**Materials and methods:** The study material included 60 patients with osteopathic fractures of the spine in the period from 2016 to 2022, who were treated at the Republican Specialized Scientific and Practical Center for Neurosurgery (Uzbekistan) and

the Multidisciplinary Clinic of the Center for the Development of Professional Qualifications of Medical Workers (Uzbekistan). The patients were subdivided into 2 groups: the first main group consisted of 24 (40%) patients who underwent a software calculation of the volume of bone cement required for injection into the body of the affected vertebra. The second control group consisted of 36 (60%) patients who did not undergo a program calculation of the bone tissue deficiency of the vertebral body.

All patients underwent a general and neurological examination, laboratory diagnostics and the most informative instrumental research methods: X-ray of the spine, magnetic resonance imaging (MRI) of the spine - 76% of studies, computed tomography and multislice computed tomography (CT / MSCT) of the spine 47%, X-ray densitometry (RD) of the lumbar vertebrae in 54% of patients with osteopathic fractures of the spine.

Static processing of the material was carried out using the methods of variational parametric and non-parametric statistics with the calculation of the arithmetic mean of the studied indicator (X) according to the formula, using the indicators of the standard deviation (s), 5% of the value of the normal distribution ( $t_{\alpha}$ ) - Laplace function, normal distribution (n) and mathematical expectation (a).

To assess the clinical condition of patients (n=60), we used the VDS pain scale (Verbal Descriptor Scale -Gaston-Johansson F., Albert M., Fagan E. et al., 1990)

Also, the Oswestry scale with the calculation of the ODI index (Jeremy C.T., Fairbank 1980) was used to assess the quality of life for all patients. All

60 (100%) patients underwent surgery.

Indications for PVP in patients with spinal osteoporosis:

- the presence of a pathological fracture of the vertebral bodies of varying degrees, without compression of the spinal cord and its roots;
- the presence of intense local pain in the spine that is not relieved by analgesics.

PVP accesses:

- transpedicular (82 vertebrae);
- transcstovertebral (46 vertebrae).

Phlebospndylography was performed in 37 (62%) patients on 83 (65%) vertebrae. With each phlebospndylography performed, with the help of a computer program created by us, the diameter of the draining veins of the vertebral bodies was measured.

The computer program "Calculation of the volume of bone mineral density" is designed to calculate the volume of mineral density of the vertebrae, based on the data of electronic images of MSCT / CT studies of patients.

Using a computer program, we examined 24 (40%) patients and processed 65 vertebrae.

In the control group (n=36) of patients, the amount of bone cement injected from 78 vertebrae into each vertebra was: 1.5 ml - 3 (4%) vertebrae, 2.0 ml - 29 (37.2%) vertebrae, 2, 5 ml - 8 (10.3%) vertebrae, 3.0 ml - 24 (30.7%) vertebrae, 3.5 ml - 8 (10.3%) vertebrae, 4.0 ml - 5 (6.4 %) of vertebrae, 4.5 ml - 1 (1%) vertebrae. In this group of patients, the software calculation of the volume of bone cement for injection was not carried out.

In the main group (n=24) of patients, the amount of bone cement injected from 78 vertebrae into each vertebra was: 3.0 ml - 8 (16%) vertebrae, 4.0 ml - 19 (38%) vertebrae, 4.5 ml - 17 (34%) vertebrae, 5.0 ml - 2 (4%) vertebrae, 5.5 ml - 1 (2%) vertebrae, 6.0 ml - 3 (6%) vertebrae.

## RESULTS

Assessment of the condition of patients in the early postoperative period in both groups was carried out using the VDS and Oswestry scores.

According to the VDS scale, in both groups, there was a decrease in pain in the studied patients in the early postoperative period. At the same time, in the main group (n=24), the scale indicators decreased to 0 points - 23 (95.8%) patients, to 2 points - 1 (4.2%) patients ( $0.13 \pm 0.05$ ), in in the control group (n=36) reduction of the scale scores to 0 points - 8 (22.2%) patients, to 2 points - 28 (77.8%) patients

( $1.55 \pm 0.24$ ). According to these data, it can be noted that in patients in the main group, complete regression of the pain syndrome was observed more often (in 95.8% of cases) than in patients in the control group (in 22.2% of cases).

According to the Oswestry scale, both groups also showed an improvement in the quality of life in the early postoperative period. Quality of life indicators in the main group (n=24) were: 13% - 9 (37.5%) patients, 16% - 13 (54.2%) patients, 20% - 2 (8.3%) patients ( $15.13 \pm 0.67$ ). In the control group (n=36): 13% - 3 (8.3%) patients, 16% - 5 (13.9%) patients, 20% - 9 (25%) patients, 23% - 10 (27, 8%) patients, 26% - 9 (25%) patients ( $21.17 \pm 1.19$ ). Based on the indicators of the Oswestry scale, in the main group of patients in the early postoperative period, the maximum decrease in the quality of life reached up to 20%, in the control group of patients up to 26%.

A comparative evaluation of the effectiveness of treatment in the early postoperative period of the main and control groups was carried out by applying the following criteria: good, satisfactory and unsatisfactory.

At the same time, a "good" result in the main group (n=24) was noted in 22 (92%) patients, a "satisfactory" result in 2 (8%) patients. In the control group, a "good" result was achieved in 8 (22.2%) patients, a "satisfactory" result in 28 (77.8%) patients.

In the same way, the assessment of the condition of patients in the late postoperative period was carried out. Out of 60 operated patients, follow-up was studied in 48 (80%) patients; from the main group - 19 patients, from the control group - 29 patients. The follow-up period for patients ranged from 6 months to 6 years (2016-2022).

According to the VDS scale in the late postoperative period in the main group (n=19), the scale indicators decreased to 0 points - 18 (94.7%) patients, to 2 points - 1 (5.3%) patients ( $0.08 \pm 0.01$ ), in the control group (n=29) the scale indicators decreased to 0 points - 14 (48.3%) patients, to 2 points - 10 (34.4%) patients, to 4 points - 5 (17.3%) patients %) of patients ( $1.38 \pm 0.01$ ). According to the long-term postoperative results of the VDS scale in the first group of patients, there is no particular dynamics. In the second group, there is a negative trend in the form of the appearance of pain reaching 4 points in 17.3% of patients.



Oswestry scale indicators in the late postoperative period in the main group (n=19) were: 6% - 1 (5.3%) patients, 8% - 4 (21.05%) patients, 10% - 3 (15.9%) patients, 13% - 7 (36.8%) patients, 16% - 3 (15.9%) patients, 20% - 1 (5.3%) patient (11.95±0.01). In the control group (n=29): 6% - 1 (3.4%) patients, 8% - 4 (13.4%) patients, 10% - 2 (6.7%) patients, 13% - 4 (13.4%) patients, 16% - 2 (6.7%) patients, 20% - 3 (10.3%) patients, 23% - 3 (10.3%) patients, 26% - 3 (10, 3%) patients, 30% - 2 (6.7%) patients, 35% - 3 (10.3%) patients, 40% - 2 (6.7%) patients (19.97±3.24). According to the long-term postoperative results of the Oswestry scale, in the main group there are positive changes in the quality of life in 42% of patients with ODI <13%. In the control group, ODI <13% was observed in 24% of patients.

When evaluating the results of treatment in patients in the late postoperative period, we noted changes in indicators in contrast to the early postoperative period in the control group of patients. At the same time, in the main (n=19) group, the indicators for evaluating the results did not change much, "good" - 18 (94.7%) patients, "satisfactory" 1 (5.3%) patients. In the control group (n=29) patients, a "good" result was achieved in 13 (44.8%) patients, "satisfactory" - in 11 (37.9%) patients, "unsatisfactory" - in 5 (17.2%) patients. It should also be noted that in the control group, 17% of patients in the late postoperative period had an unsatisfactory result of treatment.

Thus, it should be noted that in patients in the main group (n=24), during the early postoperative and long-term periods, the dynamics of clinical observations in the long-term postoperative period tended to improve throughout the follow-up. While in the control group (n=36) patients there was a negative trend, 3 (8.3%) patients had repeated fractures of the vertebral bodies.

## CONCLUSIONS

Clinical and neurological manifestations of pathological fractures of the vertebral bodies against the background of osteoporosis are noted as a local pain syndrome, reaching up to 8 points according to the VDS scale. At the same time, the height of pain sensations does not depend on the degree and number of pathological fractures of the vertebral bodies. Pain syndrome in pathological fractures of the vertebral bodies against the background of

osteoporosis sharply worsens the quality of life of patients according to the ODI scale up to 86%.

In patients with osteoporosis of the spine, as a result of degenerative-dystrophic processes in the bone tissue, involution of the draining venous vessels of the vertebral bodies occurs with a decrease in their diameter and a decrease in venous outflow.

The use of the method of percutaneous vertebroplasty in the treatment of pathological fractures of the vertebral bodies against the background of osteoporosis with a full restoration of the vertebral body support ability leads to a significant regression of the pain syndrome (95.8%).

The developed computer program "Calculation of the volume of mineral value of bone tissue" allows you to reliably determine the volume of the required amount of bone cement to be injected into the affected vertebra, thereby contributing to the full restoration of the support capacity of the damaged vertebrae.

A comparative analysis of the results of the use of monolateral and bilateral approaches during percutaneous vertebroplasty in patients with spinal osteoporosis shows that when using a monolateral approach, the amount of injected bone cement does not exceed 4 ml, and when using a bilateral approach, it reaches 6 ml or more.

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