

Two Cases of Use of Cement Augmented Screws for Osteosynthesis of the Spine

Petko Ganev¹ (✉), Vladimir Stavrev¹, A. Davarski², Rumen Minchev¹

¹Department of Orthopedics and Traumatology, Medical University, Plovdiv, Bulgaria

²Department of Neurosurgery, Medical University, Plovdiv, Bulgaria

petko_ganev@abv.bg

Abstract— Aim:

With this report we decided to present the initial experience with the use of cement augmented screws in Cotrel-Dubousset fixation in cases of patients with degenerative spines in combination with severe osteoporosis.

Material and methods:

We present two patients who underwent treatment at UMHAT "Sv. Georgi", Plovdiv. The first is a 75-year-old woman who underwent right hip arthroplasty in 2002 with a Muller prosthesis. 14 years later (in 2016) due to implant ablation, a revision of the joint with a cementless, revision modular endoprosthesis of Met-rimed was performed. In 2022, due to secondary degenerative scoliosis, the patient began to complain of pain in the lumbar spine, which required decompression and posterior fixation with cement augmented screws.

The second patient was a 72 years old female and in September 2021 suffered an osteoporotic fracture at L4 level. Balloon kyphoplasty was performed at the same level. However, due to leakage of cement into the vertebral canal, it was necessary to decompress the canal and apply again the mentioned fixation system.

The visual analog scale (VAS) was used to assess the effect of response to therapy. Both patients had no symptoms of nerve compression.

Fenestrated screws were used in both cases.

Results:

The first patient reported that months after the hip revision, she gradually began to experience low back pain. Before undergoing surgery, she determined the pain of 9 points according to VAS. There were no paresthesias in the lower extremities. One week postoperatively she determined the pain in the area of 7 points, however, due to the short period since the last intervention, we believe that the result will improve. She underwent a rehabilitation course without complications.

The second patient determined the pain preoperatively at 8 points, and 1 month postoperatively at 2 points according to VAS.

Conclusion:

We believe that the Cotrel-Dubousset fixation system with cement augmented screws is not inferior to the standard one, while providing additional strength in highly osteoporotic patients. However, we do not forget that these implants make their later extraction in need of revision, if not impossible, then at least very difficult.

Keywords— Cement Augmented Screws, Osteosynthesis of the Spine.

1. Introduction

The cement augmented osteosynthetic implants have been in practice for years. To implement this system, two main methods are mainly used: pre-injection of cement into the bone and subsequent placement of a simple screw or use of fenestrated screws through which the cement is injected, (3) (1) and the literature emphasizes on the better results with fenestrated screws. (4) In addition, the authors recommend that high-viscosity cement be injected through the fenestrated screws (5).

If we exclude the other areas and focus on their application in the spine, there are a number of reports encouraging their application (6) (7). The risk of implant migration in adult patients with severe osteoporosis and the lower rate of this complication if cement augmented screws are used is assessed. (8) (9) (10)

Studies have also been conducted to determine the risks of such a procedure, with 313 patients focusing on cement leaks and complications, vascular damage, infections, revision and implant extraction problems, and instrumental problems. As a result: cement leakage was observed in 62.3%, and no severe complications were observed. In only two patients this lead to radicular pain at level S 1. 4.1% developed infections that required deep debridement. Revisions were required in 56 patients. Within the scope of the study, 180 screws had to be removed, which was not a problem (11). However, the risk of pulmonary embolism is considered, especially in patients in whom the instrumentation is applied in the thoracic region and in combination with cardiovascular disease (12), so in our practice we would be very cautious in such cases.

An interesting study shows that in cases of two-level corpectomy in the cervical region, if only anterior instrumentation is applied without posterior, debricolage will occur. However, posterior fixation may not be performed if the front screws are cement augmented. (13)

2. Materials and methods.

In both cases we used the established technique and instrumentation: fenestrated screws through which high-viscosity cement is injected

The first patient was 75 years old and in 2002 underwent total hip replacement of the right hip joint with a Mueller endoprosthesis. (Fig.1)

The patient lived with the implant for 14 years, after which ablation developed. We consider the "life" of the prosthesis as a good result. Therefore, in 2016 it was necessary to revise the joint with a cementless, revision modular endoprosthesis of Metrimed. (Fig.2.)

The patient underwent a standard course of physiotherapy and continued without complications. However, as already noted, arthroplasty of the hip often leads to secondary scoliosis and low back pain (2).

Therefore, in 2022 it was necessary to decompress and posteriorly fix with cement augmented screws. (Fig.3)

Again, the postoperative period passed without complications. The patient reported a significant improvement in symptoms.



Fig.1



Fig.2

The second case: a woman, 72 years old, in September 2021 suffered an osteoporotic fracture of L4 and underwent balloon kyphoplasty. Similar to other cases, a leakage of cement in the canal was observed here (Fig.4,5).

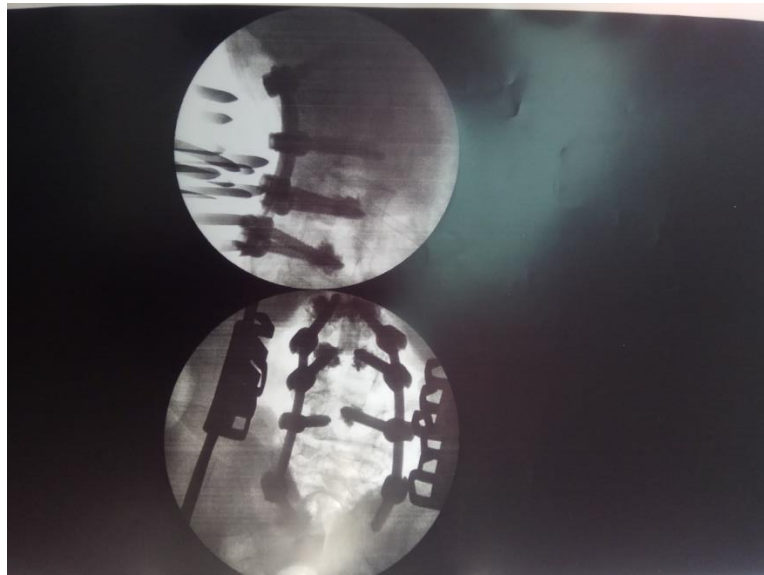


Fig.3



Fig.4



Fig.5

Despite the dramatic image from the scan, no neurological symptoms were observed except for lumbar pain in the area.

Subsequent decompression of the canal was performed and re-fixation with cement augmented screws was applied again. (Fig. 6,7).



Fig.6



Fig.7

The postoperative period was performed according to our protocol and was without complications. Again, the patient reported for improvement.

3. Results:

The first patient on admission determined the pain in the area of 9 points. according to VAS, and one week postoperatively 7 points, however, due to the short postoperative period, we believe that the result will improve. She was referred for a rehabilitation course which was completed without any deviations.

The second patient determined the pain preoperatively at 8 points, and 1 month post-operatively at 2 points according to VAS.

4. Conclusion:

We believe that the Cotrel-Dubousset fixation system with cement augmented screws is not inferior to the standard one, while providing additional strength in highly

osteoporotic patients. However, we do not forget that these implants make their later extraction if a revision is required, if not impossible, then at least very difficult.

5. References

1. Stavrev, VI. Development of the dorsal stabilization for fractures in the thoracolumbar region of the spine.; Plovdiv, 2014, Dissertation for the degree: Doctor of Science
2. Ganev P. Therapeutic possibilities of cryoablation in low back pain, 2021; Dissertation for obtaining a scientific degree: Doctor of Medicine
3. Choy W, Walsh W, Phan K, Mobbs P. Technical Note: Pedicle Cement Augmentation with Proximal Screw Toggle and Loosening; Orthop Surg. 2019.
4. Charles Y, H Pelletier, P Hydier, S Schuller, J Garnon, E Sauleau, J Steib, P Clavert. Pullout characteristics of percutaneous pedicle screws with different cement augmentation methods in elderly spines: An in vitro biomechanical study; Orthop Traumatol Surg Res. 2015.
5. Choma T, F Pfeiffer, R Swope, J Hirner Pedicle screw design and cement augmentation in osteoporotic vertebrae: effects of fenestrations and cement viscosity on fixation and extraction; Spine (Phila Pa 1976). 2012.
6. Cook S, S Salkeld, T Stanley, A Facine, S Miller. Biomechanical study of pedicle screw fixation in severely osteoporotic bone; Spine J., 2004.
7. Burval D, R McLain, R Milks, S Inceoglu. Primary pedicle screw augmentation in osteoporotic lumbar vertebrae: biomechanical analysis of pedicle fixation strength; Spine (Phila Pa 1976). 2007.
8. Percutaneous cement-augmented screws fixation in the fractures of the aging spine: is it the solution?; S Pesenti, B Blondel, E Peltier, T Adetchessi, H Dufor, S Fuentes; Biomed Res Int. 2014.
9. Singh V, R Mahajan, K Das, H Chhabra, T Rustagi. Surgical Trend Analysis for Use of Cement Augmented Pedicle Screws in Osteoporosis of Spine: A Systematic Review (2000-2017); Global Spine J. 2019 Oct
10. Seo J, Ch Ju, S Kim, J Kim, H Shin. Clinical efficacy of bone cement augmented screw fixation for the severe osteoporotic spine; Korean J Spine. 2012.
11. Fernandez M, A Herradon, A Pinera, F Bermejo, J Duart, M Vlad, M Arguisjuela, L Galovich. Potential risks of using cement-augmented screws for spinal fusion in patients with low bone quality; Spine J. 2017.
12. Janssen I, Y Ryang, J Gempt, S Mette, J Gerhardt, J Kirschke, B Meyer. Risk of cement leakage and pulmonary embolism by bone cement-augmented pedicle screw fixation of the thoracolumbar spine; Spine J. 2017.
13. Hartman S, C Thome, A Tschugg, J Paesold, P Kavakebi, W Schmolz. Cement-augmented screws in a cervical two-level corpectomy with anterior titanium mesh cage reconstruction: a biomechanical study;; Eur Spine J. 2017.

Authors

Petko Ganev is member of the Bulgarian Orthopedic and Traumatology Association (BOTA). He works as an ortopaedic surgeon at Clinic of Orthopaedics and Traumatology “St. George” University Hospital, Plovdiv, Bulgaria. He is an assistant at the Department of Orthopedics and Traumatology, Medical University Plovdiv, Bulgaria.

Vladimir Stavrev is member of the **Bulgarian Orthopedic and Traumatology Association (BOTA)**. He works as an ortopaedic surgeon at Clinic of Orthopaedics and Traumatology “St. George” University Hospital, Plovdiv, Bulgaria. He is a professor at the Department of Orthopedics and Traumatology, Medical University Plovdiv, Bulgaria.

Atanas Davarski works as a neurosurgeon at Clinic of Neurosurgery “St. George” University Hospital, Plovdiv, Bulgaria. He is an assistant at the Department of Neurosurgery, Medical University Plovdiv, Bulgaria.

Rumen Minchev is member of the **Bulgarian Orthopedic and Traumatology Association (BOTA)**. He works as an ortopaedic surgeon at Clinic of Orthopaedics and Traumatology “St. George” University Hospital, Plovdiv, Bulgaria. He is an assistant at the Department of Orthopedics and Traumatology, Medical University Plovdiv, Bulgaria.