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Destabilization of Pedicle Screws and Migration of Connecting Rod into the Posterior Cranial Fossa in a Patient After Posterior Spondylosynthesis with a Screw System

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ABSTRACT When performing osteosynthesis for spinal instability after traumatic injury, diagnostic difficulties arise due to the migration of metal structure components to distant "atypical" anatomical areas, which is associated with the risk of neurological deficit and life-threatening conditions. This article presents a casuistic case of migration of a metal structure component through an iatrogenic opening in the occipital bone into the posterior cranial fossa in a patient who had previously undergone instrumental correction for comminuted fractures of the cervical vertebrae. It should be noted that there are no data on "spontaneous" perforation of the occipital bone by metal osteosynthesis elements in the domestic literature.

Keywords: osteosynthesis, destabilization, metal construction, spondylosynthesis, rod migration

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CT – computed tomography
MOS – metal osteosynthesis

INTRODUCTION

Migration of metal structure components to distant anatomical areas is not a frequent complication after osteosynthesis for spinal instability that arose after traumatic injury. Diagnostic difficulties are caused by possible dislocation of metal osteosynthesis (MOS) to "atypical" structures, which is associated with the risk of neurological deficit, vascular complications and life-threatening conditions [1].

The aim of the report: to demonstrate a casuistic case in the form of migration of a component part of a metal structure through an iatrogenic opening in the occipital bone into the posterior cranial fossa, noted in a patient who had previously undergone instrumental correction for comminuted fractures of the cervical vertebrae.

Clinical observation

Patient O., 30 year-old, was involved in a traffic accident in April 2018, which resulted in a severe combined injury. Based on the results of computed

tomography (CT), the following was established: contusion of the left frontal-parietal region of the brain, subarachnoid hemorrhage, longitudinal fractures of the bodies and transverse processes of the left C2, C3. An emergency surgical intervention was performed in the volume of: posterior spondylosynthesis of C1-C4 with an 8-screw system "Double Medical" (China). The postoperative period was uneventful, the patient was discharged for outpatient treatment.

An objective method for determining the quality of installation of a transpedicular fixator is a series of dynamic CT studies in the late postoperative period [2]. According to the study of 16.04.2019, malposition of the first locking screw on the right was revealed, dislocation of the component part of the metal structure in the direction of the occipital bone up to 6.8 mm (Fig. 1). From the anamnesis, it was found that there were no complaints at this stage. A consultation with a neurosurgeon was suggested. He did not seek medical help.

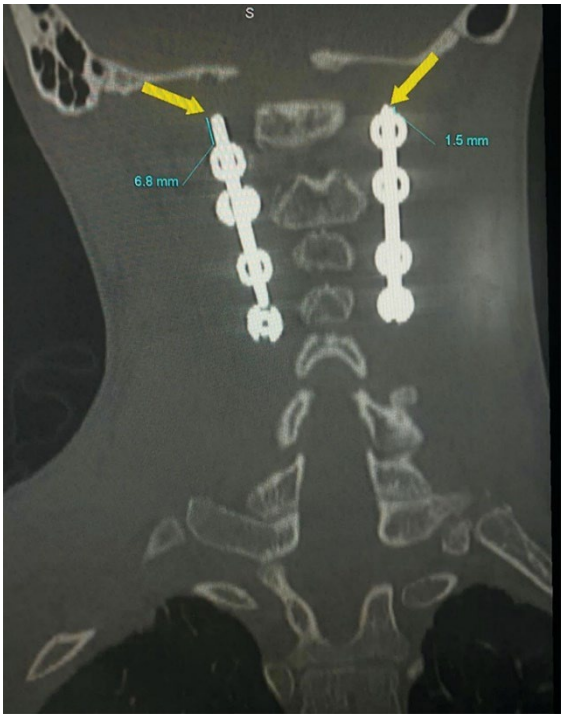

Fig. 1. Computed tomography of the cervical spine with malposition of the first locking nut of the upper threaded screw on the right, dislocation of the component part of the metal structure in the direction of the occipital bone up to 6.8 mm

On 20.12.2022, the patient was examined on a routine basis. He noted a decrease in visual acuity, mainly during the daytime, and associated the deterioration of his condition with being in an upright position. According to the results obtained, during multispiral computed tomography, negative dynamics were determined in the form of destabilization of the pedicle screws and migration of the rod into the posterior cranial fossa, which spreads through the right hemisphere of the cerebellum, closely adjoining its tentorium (Fig. 2).

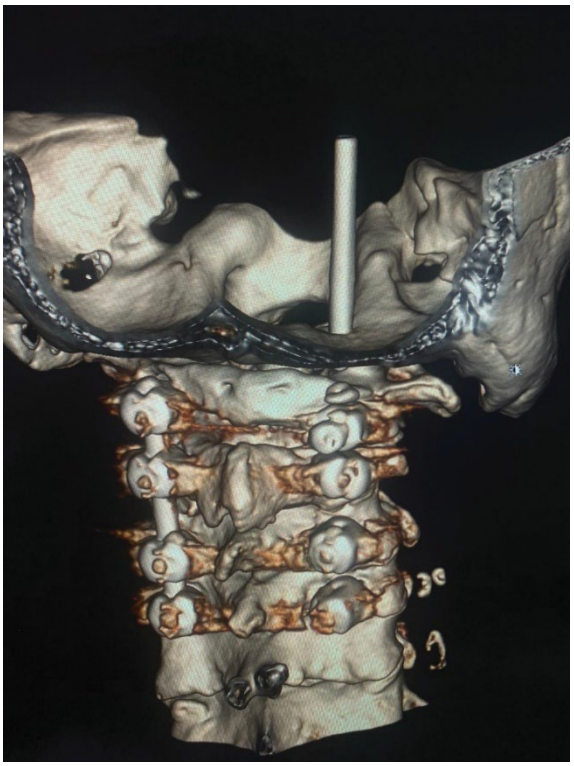

Fig. 2. Computed tomography of the cervical spine with migration of the rod into the posterior cranial fossa

As a result of the dislocation of a component of the metal structure, an abnormal opening appeared in the occipital bone due to its perforation 20 mm below the “nuchal” line and 14 mm to the right of the foramen magnum in the posterior cranial fossa.

At the time of examination, a rod coming out of the screw heads was visualized in the lumen of the iatrogenic opening, and loosening of the threaded connections of the device was also noted (Fig. 3). The patient was recommended to consult a neurosurgeon.

Fig. 3. Computed tomography of the cervical spine with the rod coming out of the screw heads, as well as unscrewed threaded connections of the device

DISCUSSION

Migration of the endoprosthesis components is probably due to insufficient adaptation of the connecting rods to the slots of the screw heads, as well as the structural features of the MOS rod such as a streamlined shape and a small cross-section [3]. As a result of consolidated interaction between clinicians and diagnosticians, it was established that a decrease in visual acuity is most likely associated with transient ischemia of the medial surface of the occipital lobe due to an increase in the pressure of the rod while the patient is in an upright position [4, 5]. At the time of transition to the horizontal plane, the degree of compression decreases, but to confirm this hypothesis, a more detailed study of the structural relationship of the structures under study is required using magnetic resonance imaging [6]. It is worth noting that there are no data on "spontaneous" perforation of the occipital bone by MOS elements in the domestic scientific literature. In foreign sources, there are references to the possibility of migration of metal components into the posterior cranial fossa. Thus, in the article *"Migration of Metal Construct Components into the Posterior Cranial Fossa: A Rare Complication of Spinal Instrumentation"* the authors note a similar case that arose after posterior spinal fusion, but no neurological deficit was observed [7]. *Belsare Kiran et al*. presented a case of rod migration into the cerebellum through the foramen magnum after fixation of the cervical spine, which led to the patient's death 18 months after surgery. Despite the presence of cephalgia, the patient refused surgery [8].

There are also references to a retrospective study of a cohort of patients. The work analyzed data on complications after spinal osteosynthesis. It was found that the main postoperative complications are radiculopathy, pseudoarthrosis, and breakage of the screw-rod system [9]. All authors of the above-mentioned manuscripts are committed to the hypothesis of the role of loosening of the screw-rod system as a possible etiologic basis for migration. They also draw attention to factors that may contribute to migration, including improper placement or fixation of metal elements, insufficient stability of the structure, or anatomical features of the patient.

CONCLUSION

The low incidence of the described pathology complicates the timely identification of metal structure failure and is highly relevant, since the data from the few sources on the use of radiation methods at later stages indicate the development of severe pathological conditions leading to neurological deficit and a significant decrease in the patient's quality of life. A precise estimate of the true prevalence of this complication remains elusive due to the insufficient number of literature references on this issue. One of the research approaches to prevent metal structure migration into the posterior cranial fossa includes more accurate planning and positioning of components during surgery. The use of three-dimensional models of the patient's skull using computer navigation can help surgeons achieve more accurate and stable results. Further reports of such cases are extremely important for the development of effective strategies for the prevention and treatment of this complication. Constant monitoring of the metal structure (using X-ray equipment) is necessary to assess possible loosening and migration of the implant, even in patients with no clinical symptoms.

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