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DIAGNOSTIC AND TREATMENT METHODS

Skryabin E.G.

SACRUM WITH FIVE PAIRS OF SACRAL OPENINGS, AS A PATHOGNOMONIC SYMPTOM OF LUMBOSACRAL TRANSITIONAL VERTEBRAE

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Introduction. Clinical experience shows that during radiological examination of the pelvis, patients are often diagnosed with a sacrum with five pairs of sacral openings, while normally there should be four. Purpose: To which form of dysplasia should cases of diagnosis of the sacrum with five pairs of sacral openings be attributed. Material and methods. The clinical material for the study was the results of computed tomography of the lower lumbar spine and pelvic bones in 78 patients who were diagnosed with a sacrum with five pairs of sacral openings. The CT examination of the patients was carried out on a 128-slice «General Electric» device. Results. The study established that the analyzed group of 78 patients was heterogeneous and consisted of two subgroups. Patients of the first subgroup (52 (66.7%) patients) had fused upper sacral vertebrae by transverse processes to the left and right of the sacral crest. Patients of the second subgroup (26 (33.3%) patients) had similar bone fusion of two upper sacral vertebrae on one side, there was no such concrescence on the contralateral side, and synchondrosis was clearly defined. Discussion. The sacrum with five pairs of sacral openings should be attributed to such a congenital pathology of the lumbosacral junction as lumbosacral vertebrae. It is known that this disease is divided, according to the classification of A.E. Castellvi et al. (1984), into 7 different types. Those clinical observations that were diagnosed in patients of the studied cohort should be attributed to types IIIb (first subgroup, 52 patients) and IV (second subgroup, 26 patients) of the disease. In the clinical picture of each of the types of pathology, vertebrogenic pain syndrome of lumbosacral localization prevails. Conclusion. The presence of such a bright radial symptom of sacral pathology as five pairs of sacral openings allows for timely diagnosis of cases of transitional lumbosacral vertebrae, informing patients about the nature of the disease, and, if necessary, prescribing therapy adequate to the severity of the condition.

Keywords: sacrum, cranial sacral vertebrae, sacral openings, lumbosacral transitional vertebrae.

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Introduction. In clinical practice, there are often situations when, during a radiological examination of the pelvis, patients are diagnosed with a sacrum with five pairs of sacral openings [9]. In these cases, the question arises: is this radiological picture normal or is it a variant of pathology [11]. There is no direct answer to this question in modern literary sources [3].

Purpose: To establish which form of dysplasia should be attributed to cases of diagnosis of a sacrum with five pairs of sacral openings.

Material and methods. The clinical material for the study was the results of computed tomography (CT) of 252 patients aged 12 to 86 years with injuries and diseases of the lower lumbar spine and pelvis, in whom images of the sacrum were "obtained" during the radiological diagnostics. In total, out of 252 patients

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studied, 78 (30.9±5.2%) people were found to have a sacrum with five pairs of sacral openings. Of the 78 patients in this cohort, 35 were girls and women (44.9±8.4%), and 43 (55.1±7.6%) were boys and men.

The patients underwent CT examination on a 128-slice General Electric machine. When analyzing CT images, the sacrum was specifically studied, including determining the number of sacral vertebrae and the number of sacral openings.

Statistical processing of the clinical material consisted of determining the relative value of the indicator in percent (P) and the representativeness error of the obtained relative value (±m).

The study was approved by the local ethics committee of the Federal State Budgetary Educational Institution of Higher Education «Tyumen State Medical University» of the Ministry of Health of the Russian Federation (protocol No. 125/06.1. dated 03/20/2025).

Results. The study cohort of patients with five pairs of sacral foramina consisted of 78 individuals. The radiographic picture of the sacrum was generally typical in all clinical observations, regardless of the age of the patient under study (Fig. 1).

The differences in the radiographic picture of the patients under study concerned only the degree of expression of degenerative-dystrophic changes in the lower lumbar vertebral-motor segments and in the sacroiliac joints. The older the patients, the more pronounced the changes were, and this is a natural involutional process [4].

When analyzing the results of computed tomography of patients in the study cohort, not only the result of the sacrum reconstruction (3D images) but also its scans (sections) were assessed (Fig. 2).

The presented tomograms clearly show that the cranial sacral vertebra has a complete bone fusion with the underlying vertebra on both the left and right sides. Such a radiation picture, with complete bilateral bone fusion, among 78 patients was diagnosed in 52 (66.7±6.5%) clinical observations. In the remaining 26 (33.3±9.2%) patients, the radiation picture from the sacrum side was different, while they also had a sacrum with 5 pairs of openings (Fig. 3).

In Fig. 3 it is evident that the shape of the sacrum differs from those shown in Fig. 1 and 2. Thus, if on the right side the upper sacral vertebra has a full bone fusion with the caudally located vertebra, forming the wing of the sacrum, then on the left side, at the same level, instead of bone fusion, a synchondrosis is clearly visible. In the remaining patients of this subgroup, the radiographic picture on the sacrum sections was similar. Thus, the group of 78 patients with five pairs of sacral openings was represented by two subgroups of patients: one - with a full bilateral bone fusion between two cranial sacral vertebrae (52 (66.7±6.5%) people) and the second - with unilateral bone fusion, combined with contralateral synchondrosis in the cranial parts of the sacrum (26 (33.3±9.2%) people).

Discussion. Five sacral vertebrae, finally merging with each other by the age of 22-24 years in modern humans, form the sacrum, which has four pairs of sacral openings, which is the norm [13]. In cases where patients are diagnosed with a sacrum with five pairs of openings by means of radiographic imaging, these situations should be regarded as a variant of dysplasia, different from the well-known ones, such as agenesis, caudal regression, dysraphism, dysmorphism, posterior wall defect, spina bifida posterior and some others.

Establishing the specific nature of pathological changes in the sacrum is possible only with the use of modern methods of radiographic imaging - magnetic resonance imaging and CT [8]. In the clinical cases discussed (Fig. 1, Fig. 2, Fig. 3, Fig. 4), it was the CT results that made it possible to establish the presence of bone fusion and synchondrosis between two cranial sacral vertebrae in the presence of five pairs of sacral openings.

It was the CT results that allowed us to classify the revealed radiation symptoms of dysplasia in all 78 patients of the study cohort as a pathology such as transitional lumbosacral vertebrae [12]. Transitional vertebrae are differentiated according to the classification of A.E. Castellvi et al. [6]. According to the criteria of this classification, four types of transitional vertebrae are distinguished (I, II, III, IV), with the first three types being divided into subtypes "a" and "b". Thus, in general, the structure of transitional vertebrae includes 7 forms of the disease: Ia, Ib, IIa, IIb, IIIa, IIIb, IV. Those clinical observations that were diagnosed in patients of the study cohort, according to the Castellvi classification, should be classified as types IIIb and IV of the disease. It is with these two forms of transitional lum-

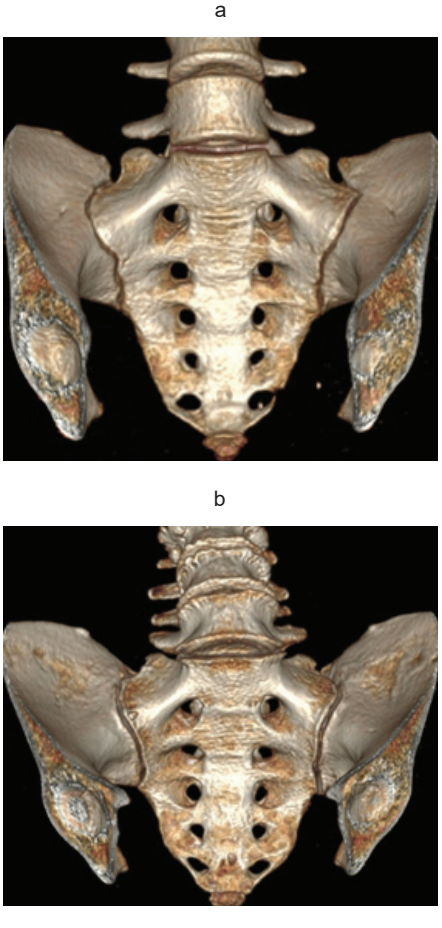

Fig. 1. Computer tomograms of the sacrum of patients 16 years old (a) and 60 years old (b). Five pairs of sacral openings

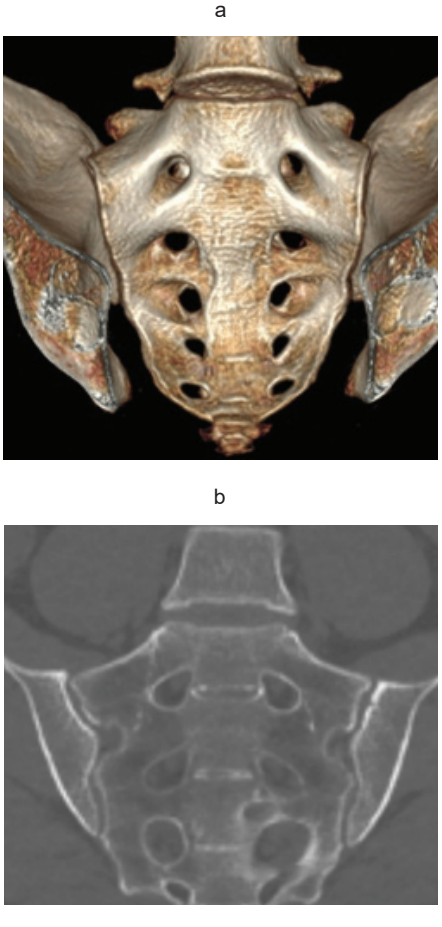

Fig. 2. Computer tomograms of the sacrum of a 32-year-old patient. Volumetric (a) and layered (b) images

a

b

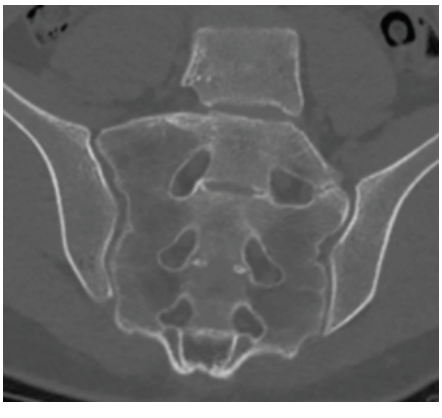

Fig. 3. CT scans of the sacrum of a 29-year-old patient. Right-sided bone block (a), left-sided synchondrosis (b) between two cranial vertebrae

bosacral vertebrae that the sacrum in the patients under study has five pairs of sacral openings [6].

It is known that the average frequency of diagnosis of transitional vertebrae in the modern population is 17% of clinical observations [5]. In the structure of transitional vertebrae, the share of IIIb and IV types of the disease accounts for 4.8±0.3% and 6.7±0.4% of cases. The first rank places in the structure of transitional vertebrae are occupied by IIa and IIb types - 26.9±0.6% and 25.9±0.6% of clinical observations. These indicators were obtained during the analysis of 17 scientific articles by various groups of authors from Europe, Asia and America [3].

The problem of transitional lumbosacral vertebrae is relevant due to the fact that this pathology is one of the most common causes of vertebrogenic pain syndrome of lumbosacral localization [9]. With this anomaly, over time, patients develop extraforaminal stenosis, which is a high-risk factor for impingement of the L5, S1 roots [7]. In addition, according to A. García López et al., transitional vertebrae impart abnormal rigidity (the article uses the expression "abnormal rigidity") to the lumbosacral junction, which negatively affects the shock-absorbing function of the spine as a whole [10]. In cases where the radiographic picture of the transitional vertebrae is accompanied by clinical symptoms, primarily pain syndrome, patients may be diagnosed with “Bertolotti syndrome” [2], and the algic syndrome is assessed as neuropathic, caused by compression of the nerve roots [1].

That is why early diagnostics of transitional lumbosacral vertebrae is an extremely important task, which can lead to an increase in the quality of life of such patients with this disease. The presence of such a bright radial symptom of sacral pathology as five pairs of sacral openings will allow timely diagnosis of the disease, inform patients about its essence, and, if necessary, prescribe adequate therapy.

Conclusions. 1. In a group of 252 patients, 78 (30.9%) were diagnosed with a sacrum with five pairs of sacral openings, which should be regarded as a symptom of transitional lumbosacral vertebrae;

2. Among 78 patients with five pairs of sacral openings, 52 (66.7%) had complete bone fusion of two cranial vertebrae, which should be classified as type IIIb of the disease. In 26 (33.3%) patients, bone fusion of the cranial vertebrae on one side and synchondrosis at the same level on the contralateral side were detected, which corresponds to type IV of pathology according to the classification of A.E. Castellvi et al. (1984);

3. The main clinical symptom of transitional lumbosacral vertebrae is vertebrogenic pain syndrome, caused primarily by impingement of the L5, S1 roots and a decrease in the shock-absorbing function of the spine.

The authors declare no conflict of interest in the submitted article.

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