

DOI: <https://doi.org/10.17816/vto89567>



Features and tactics of management of patients with joint hypermobility (Clinical observation)

Anatoliy K. Orletskiy, Dmitriy O. Timchenko, Elena S. Kozlova*

N.N. Priorov National Medical Research Center of Traumatology and Orthopedics, Moscow, Russia

ABSTRACT

There are not enough studies in the literature on the treatment of patients with impaired collagen homeostasis. Dysplastic changes in the bone and ligamentous structures of the shoulder joint are a risk factor for the development of chronic instability and can be one of the reasons for relapses after surgery. Orthopedic disorders of this pathology should be corrected by operative or conservative techniques for each patient individually.

The choice of treatment tactics for patients with chronic post-traumatic multiplanar instability of the shoulder joint against the background of connective tissue dysplasia.

Surgical treatment was used, the duration of wearing the orthosis on the shoulder joint area was increased in order to ensure the centering of the humeral head, and a rehabilitation program was proposed.

Keywords: chronic instability of the shoulder joint; arthroscopy; rehabilitation; connective tissue dysplasia; collagen homeostasis.

To cite this article:

Orletskiy AK, Timchenko DO, Kozlova ES. Features and tactics of management of patients with joint hypermobility (Clinical observation). *N.N. Priorov Journal of Traumatology and Orthopedics*. 2021;28(3):59–64. DOI: <https://doi.org/10.17816/vto89567>

Received: 02.12.2021

Accepted: 06.12.2021

Published: 28.12.2021

DOI: <https://doi.org/10.17816/vto89567>

Особенности и тактика ведения пациентов с гипермобильностью суставов (Клиническое наблюдение)

А.К. Орлецкий, Д.О. Тимченко, Е.С. Козлова*

Национальный медицинский исследовательский центр травматологии и ортопедии им. Н.Н. Приорова, Москва, Россия

АННОТАЦИЯ

В литературе недостаточно исследований о лечении пациентов с нарушением коллагенового гомеостаза. Диспластические изменения костных и связочных структур плечевого сустава являются фактором риска развития хронической нестабильности и могут служить одной из причин рецидивов после оперативного лечения. Ортопедические нарушения данной патологии должны корректироваться оперативными или консервативными методиками для каждого пациента индивидуально.

Описан выбор тактики лечения пациентов с хронической посттравматической многоплоскостной нестабильностью плечевого сустава на фоне дисплазии соединительной ткани.

Применялось хирургическое лечение, увеличена продолжительность ношения ортеза на область плечевого сустава для обеспечения центрации головки плечевой кости, а также предложена программа реабилитации.

Ключевые слова: хроническая нестабильность плечевого сустава; артроскопия; реабилитация; дисплазия соединительной ткани; коллагеновый гомеостаз.

Как цитировать:

Орлецкий А.К., Тимченко Д.О., Козлова Е.С. Особенности и тактика ведения пациентов с гипермобильностью суставов (Клиническое наблюдение) // Вестник травматологии и ортопедии им. Н.Н. Приорова. 2021. Т. 28, № 3. С. 59–64. DOI: <https://doi.org/10.17816/vto89567>

Рукопись получена: 02.12.2021

Рукопись одобрена: 06.12.2021

Опубликована: 28.12.2021

BACKGROUND

Shoulder joint bone structure examination (Fig. 1 *a, b*), as well as the identification of the signs of dysplasia, is advisable in patients with primary and recurrent instability to decide on a further management approach. The literature revealed a relationship between the counts of autoantibodies to certain types of collagen and the nature of external and cardiac manifestations of connective tissue dysplasia. An increased level of autoantibodies against types I and II collagens was registered in patients with pectus excavatum, scoliosis, severe joint hypermobility syndrome, and multiple intracardiac microanomalies. That to collagen type I was registered in cases of platypodia, and that to collagen types I, II, and V were revealed in patients with a prolapsing mitral valve myxomatous degeneration. An increased level of anti-collagen antibodies in patients with severe external and cardiac dysplastic signs indicates impaired autoimmune regulation mechanisms of collagen metabolism. The analysis of autoantibodies against collagen concentrations in the blood plasma of patients with joint hypermobility syndrome, considering its scoring [1], revealed high levels of autoantibodies of type I collagen with maximum values in severe articular hypermobility (4.9 ± 0.5 and 6.2 ± 0.7 $\mu\text{g/ml}$ for mild and severe syndromes, respectively). Patients with severe joint hypermobility syndrome were noted with increased autoantibody levels of type II collagen (3.5 ± 0.3 $\mu\text{g/ml}$) compared to those with both control and mild hypermobility syndrome (2.7 ± 0.3 $\mu\text{g/ml}$) [2]. Additionally, the examination of patients with joint

hypermobility has an algorithm. The criteria indicated in the table were used for the examination.

Joint hypermobility syndrome is established in the presence of 2 major criteria, 1 major and 2 minor criteria, or only 4 minor criteria [3].

Multiplanar instability is characterized by shoulder instability in any position. However, most often, instability occurs in the anterior and inferior directions. This type of instability develops due to repeated dislocations and subluxations. According to the most commonly used classification, multiplane instability is in turn subdivided into the following:

- instability that occurs with hyperelasticity of the ligaments due to systemic genetic connective tissue structure disorders (Marfan syndrome and Ehlers–Danlos syndrome);
- multiplanar asymptomatic anterior and inferior instability;
- multiplanar posterior and inferior instability;
- multiplanar anterior and posterior instability [5, 6].

Shoulder joint instability is also classified based on the displacement plane. Therefore, the following are distinguished:

- horizontal instability;
- vertical instability;
- mixed instability (both horizontal and vertical plane displacement) [7].

To date, the main links in the pathogenesis of post-traumatic instability have been well studied, including the following:

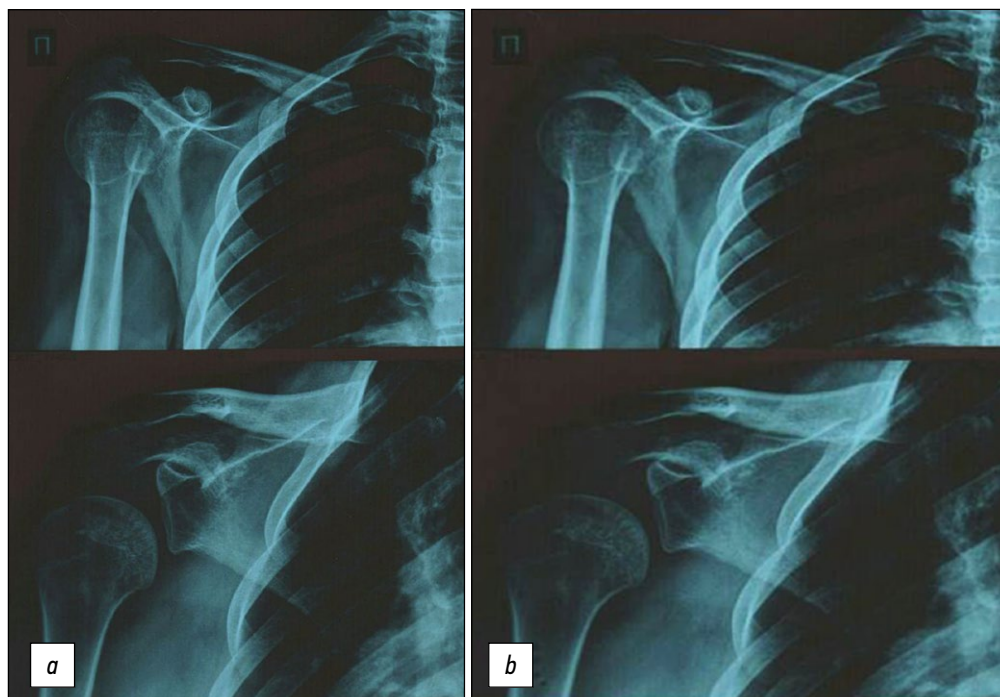


Fig. 1. View of radiographs of a patient with shoulder dysplasia.

Table. The Brighton criteria for joint hypermobility syndrome (R. Keer, R. Graham, 2003)

Major criteria	Minor criteria
The Beighton joint hypermobility score is 4–9 points. Arthralgia lasting at least 3 months in 4 or more joints	The Beighton hypermobility score is 1, 2, or 3–9 (Beighton score 1–3 at age 50 or older) Arthralgia for at least 3 months in 1–3 joints or back pain for at least 3 months, spondylolisthesis, or spondylosis Subluxations, dislocations in >1 joint, or recurrent ones in 1 joint Epicondylitis, bursitis, or tenosynovitis Marfan-like appearance (asthenic body type, tall stature, arachnodactyly [positive wrist test], upper to lower segment ratio of <0.89, height to arm span ratio of >1.03) Skin is thinner, with increased extensibility (skin fold on the hand dorsum is pulled by >3 cm), stretch marks, or tissue paper-like suture Eye symptoms include drooping eyelids or antimongoloid slant Varicose veins, ventral hernias, or uterine or rectal prolapse

- decreased mechanical strength of the joint capsule and rotator cuff of the muscle complex due to their stretching or rupture;
- a disorder of proprioceptive information transmission from the mechanoreceptors of the central nervous system ligaments and inadequate feedback;
- impaired regeneration of capsule and periarticular tissues, with scar formation and capsule weakening with a tendency to stretch;
- atrophy of the muscles stabilizing the joint [8, 9].

Here, we described a case of a positive outcome in an 18-year-old female patient who had 4 minor criteria for joint hypermobility syndrome (Table 1, Fig. 2). The anamnesis revealed that surgical treatment was performed and rehabilitation was conducted in the late postoperative periods to restore the function of the operated upper limb.

Clinical case. Patient K., 18 years old.

The patient was diagnosed with chronic post-traumatic multiplanar instability of the right shoulder joint associated with the consequences of post-traumatic upper brachial plexopathy and alar scapula syndrome, presumably due to muscle imbalance with severe shoulder joint dysfunction, and condition after multiple surgical interventions.

In May 2016, she had a right shoulder joint injury (hit by a ball in a straight arm), which led to a right shoulder joint dislocation. In the next 3 months after the injury, right shoulder joint instability developed.

Repeated course of conservative treatment in a primary care facility had no improvement. In December 2016, the patient was hospitalized in the N.N. Priorov National Medical Research Center of Traumatology and Orthopedics for consultation and further treatment approach

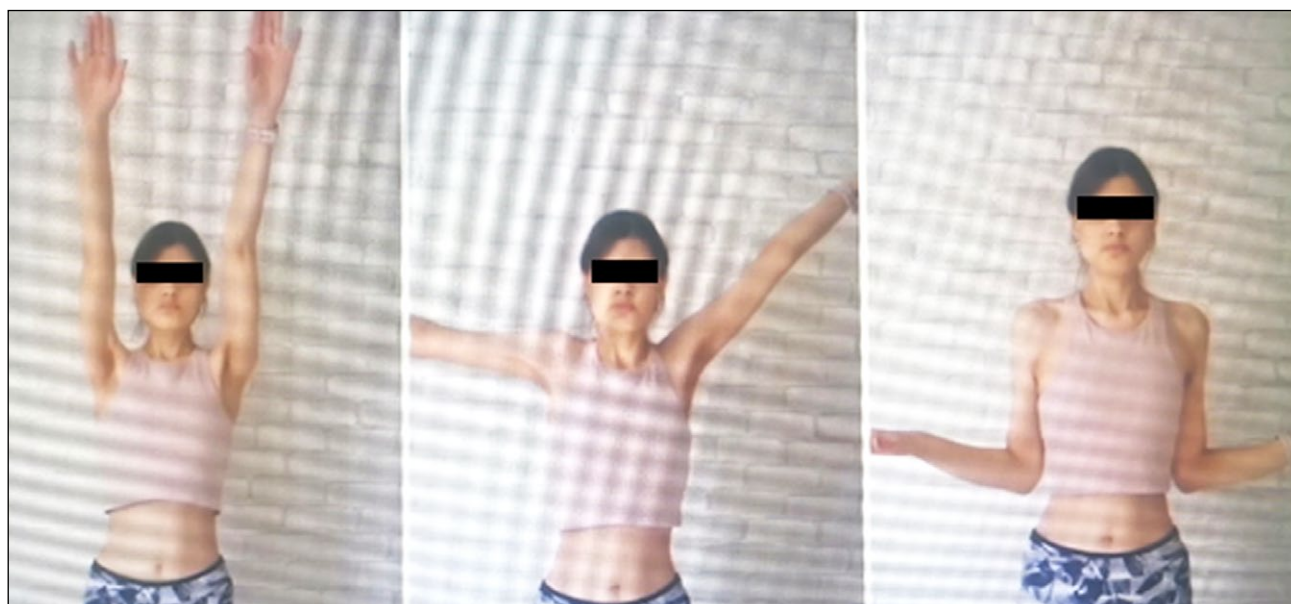


Fig. 2. View of a patient with joint hypermobility syndrome. Long-term results of treatment (after 6 months).



Fig. 3. The patient's appearance after multiple surgical interventions (May 2017).

determination. Arthroscopy of the right shoulder joint and capsulography were performed.

In January 2017, the instability recurred with slight right shoulder joint physical exertion. Centering and fixation of the right humeral head with the spokes was performed. She was discharged for outpatient treatment at the primary care facility. In April 2017, she entered the department of the N.N. Priorov National Medical Research Center of Traumatology and Orthopedics. Lavsanodesis was made (by the type of suspension) of the right shoulder joint.

In connection with the lavsan tape eruption in May 2017, a repeated lavsanodesis of the joint was performed, as well as a case conference.

In September 2018, the patient underwent examination and conservative treatment at a hospital.

Results revealed paralytic subluxation of the humeral head on the right and conditions after surgical treatment were diagnosed.

In January 2020, the lavsan tape was removed from the right shoulder.

Figure 3 presents the view of the patient after the surgery.

The patient was admitted for treatment at the Department of Medical Rehabilitation of the N.N. Priorov National Medical Research Center of Traumatology and Orthopedics, where therapy was performed, which included physiotherapy exercises (personal coaching) to strengthen the shoulder muscles, massage the collar zone, shoulder muscles, and the right upper limb forearm, magnetic therapy on the shoulder joint No. 10 to improve trophism and pain relief, and electrical stimulation of the deltoid



Fig. 4. Movement in the shoulder joint of the right upper limb when using the orthosis.

muscle and short rotators number 10, daily. The patient was recommended to wear an orthosis (Fig. 4). Her condition improved and she was discharged for outpatient treatment at the primary care facility to continue the rehabilitation (Fig. 2). She continued the course of active rehabilitation in cooperation with the DJAMSY clinic (at the patient's primary care facility).

DISCUSSION

The question arises about the further prognosis or the need for surgical treatment in patients with multidirectional shoulder joint instability in impaired collagen homeostasis and undifferentiated connective tissue dysplasia, as well as the important role of rehabilitation in early and late periods.

Surgical interventions for traumatic shoulder dislocations are infrequently performed. Surgical treatment indications include irreducible dislocations, significant displacement of the large humeral tubercle or the marginal fragment of the scapular articular process, as well as chronic dislocations. The surgical indication for arthroscopy in simple dislocations includes a high level of functional aspiration of the patient or a combination of Bankart and Hill-Sachs injuries and short shoulder rotators in individuals with an average physical activity level [4].

CONCLUSION

The clinical example shows that, despite the obvious signs of connective tissue dysplasia, surgical treatment was chosen for untimely conservative treatment in the next 3 months from the injury, which led to multiple surgical interventions but did not improve and restore the function of the operated upper limb. We recommend the selection of an individual plan of rehabilitation measures for such patients at all treatment stages (reduction, immobilization, and functional restoration) [4].

ADDITIONAL INFO

Author contribution. Thereby, all authors made a substantial contribution to the conception of the work, acquisition, analysis, interpretation of data for the work, drafting and revising the work, final approval of the version to be published and agree to be accountable for all aspects of the work.

Funding source. Not specified.

Competing interests. The authors declare that they have no competing interests.

Consent for publication. Written consent was obtained from the patient for publication of relevant medical information and all of accompanying images within the manuscript.

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AUTHORS INFO

***Elena S. Kozlova**, physiotherapist;
address: 10, Priorova str., 127299, Moscow, Russia;
e-mail: elenako352@gmail.com

Anatoliy K. Orletskiy, MD, PhD, Dr. Sci. (Med.),
traumatologist-orthopedist;
e-mail: nova495@mail.ru

Dmitriy O. Timchenko, MD, PhD, Cand. Sci. (Med.),
traumatologist-orthopedist;
eLibrary SPIN: 6626-2823;
e-mail: d.o.Timchenko@mail.ru

ОБ АВТОРАХ

***Елена Сергеевна Козлова**, врач по лечебной физкультуре, физиотерапевт;
адрес: Россия, 127299, Москва, ул. Приорова, д. 10;
e-mail: elenako352@gmail.com

Анатолий Корнеевич Орлецкий, д-р мед. наук, профессор,
врач травматолог-ортопед;
e-mail: nova495@mail.ru

Дмитрий Олегович Тимченко, канд. мед. наук,
врач травматолог-ортопед;
eLibrary SPIN: 6626-2823;
e-mail: d.o.Timchenko@mail.ru

* Автор, ответственный за переписку / Corresponding author