

Morphological Aspects Specific to the Location of False Joints

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Abstract: In recent years, skeletal bone injuries have become increasingly severe and complex due to the intensification of urbanization processes, the increase in the frequency of road traffic accidents and the total number of injuries caused by moving machinery in production.

At the same time, in the structure of injuries to the musculoskeletal system, fractures of the long bones of the extremities occupy a leading place, accounting for up to 82.8% of all fractures [3]. A significant portion of them are diaphyseal fractures.

Despite certain scientific achievements, the percentage of unsatisfactory results in the treatment of high-energy injuries, leading to complications such as delayed consolidation and non-union of fractures, and the formation of pseudoarthroses, does not tend to decrease.

Keywords: *formation of pseudoarthrosis, musculoskeletal system, diaphyseal fracture.*

Introduction

A pseudoarthrosis is a pathological formation in the structures of tubular, long bones of the body. They are mainly formed there. False joints develop after injuries, traumatic or, less often, pathological fractures. Another name is pseudoarthrosis. The disease is characterized by the formation of a mobile zone where it should not be. That is, it disrupts the continuity of bone tissue. The disorder can develop in any patient. According to statistics, up to 3% of fractures end in the formation of pseudoarthrosis, which is actually quite a lot. Treatment is required. The bone affected by the formation of a pseudoarthrosis loses its characteristics. The risks of fractures, injuries and tissue degeneration develop. False joints and defects of the articular ends of the limbs as an unfavorable outcome of fractures of long tubular bones are not so rare and are observed in some situations after reconstructive surgeries. Common forms of false joints and defects of a part of the bone are fibrous pseudoarthrosis (the ends of the bone are connected by loose connective tissue), neoarthrosis (pathological joint with the synovial membrane), a true defect of the bone part and a defect of the articular end.

The diagnosis is made on the basis of X-ray scanning data. The main method of treatment is surgical intervention. The general principles of the operation are partial removal of the formed pathological tissue and subsequent fixation of bone fragments using titanium structures.

Causes of pseudoarthrosis

Normally, after a fracture, the bone grows together to form a callus, at first it is loose and fragile, but then (normally) it is rebuilt into normal bone tissue. In order for the process to proceed as expected, various conservative and surgical treatment methods are used, the main task of which is to compare and fix bone fragments. However, sometimes, for one reason or another, the recovery processes are disrupted, in which case a pseudoarthrosis is formed at the fracture site.

Local causes lead to the development of pathology:

- unsuccessful orthopedic surgeries
- getting of soft tissues between fragments
- weak fixation of bone fragments
- reduction of immobilization periods during conservative treatment
- early removal of fixators
- failure of the patient to comply with the recommendations of the traumatologist - early, inadequate load on the limb
- inadequate plaster immobilization
- errors in conservative therapy
- overstretching of fragments during skeletal traction (or external fixation devices)
- purulent complications (with open fractures or infection during surgery)

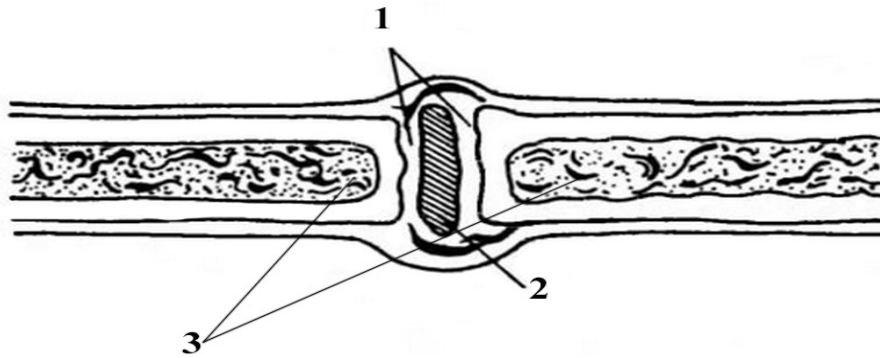
The cause of the development of congenital pseudoarthrosis is a violation of the nutrition and innervation of the corresponding segment of the limb in the prenatal period.

Pseudoarthrosis can be a consequence of diseases:

- Ehlers-Danlos syndrome
- osteogenesis imperfecta
- fibrous dysplasia
- metastatic cancer
- calcium metabolism disorders, osteoporosis in the elderly
- ochronosis (alkaptonuria) and other diseases associated with metabolic disorders

A pseudoarthrosis is a rather unpleasant pathology that can cause a lot of problems for both an adult and a child. Over time, the fragments become smooth, covered with cartilaginous tissue and a capsule resembling a joint capsule. In medicine, such a pathology is called pseudoarthrosis or false joint.

With acquired pseudoarthrosis, the gap between the bone fragments is filled with connective tissue. The structure of long-standing pseudoarthrosis gradually changes. The ends of the fragments are covered with cartilage and become more mobile. In the area of the gap, a joint cavity covered with a capsule and filled with synovial fluid is formed. In case of congenital pathology, the affected area is filled with bone tissue that is not fully formed and cannot withstand the load on the limb.



Scheme of fibrosynovial pseudoarthrosis (1 - pseudoarticular surfaces; 2 - fibrosynovial membrane; 3 - fragments of tubular bone)

Posttraumatic (acquired) pseudoarthrosis develop after 2-3% of fractures, most often formed on the tibia, radius and ulna, less often - on the humerus, femur and clavicle. Congenital pseudoarthrosis (mainly) is localized on the bones of the lower leg, accounts for 0.5% of all congenital anomalies of the musculoskeletal system.

Symptoms of pseudoarthrosis

Most patients have a history of trauma (in rare cases, pseudoarthrosis can be a congenital pathology).

The main symptoms of pseudoarthrosis:

- pathological mobility at the fracture site, which persists after the healing period;
- intense pain at the fracture site;
- deformation of the damaged area;
- limited support on the limb;
- difficult movement of the joints;
- noticeable decrease in muscle strength;
- impaired blood circulation in the area of injury.

Despite the treatment of the fracture, there is pain that persists after the normal time required for the formation of a full-fledged bone callus.

The clinical picture depends on the location and type of pseudoarthrosis.

A pseudoarthrosis of the clavicle manifests itself as:

- pain, tissue swelling
- visible drooping of the shoulder on the affected side
- limitation of movement - it is difficult for the patient to raise the upper limb

A pseudoarthrosis after a fracture of the humerus can be suspected by crunching, deformation, and a feeling of looseness in the shoulder. Movement in the joint is impaired and painful. The arm may be uncontrollable due to dangling fragments of the humerus on the muscles, which is why the patient is forced to hold the limb.

Classification of pseudoarthrosis

Pseudoarthrosis is classified:

by origin — congenital, acquired, pathological (after a femoral neck fracture in an elderly patient).

by type:

- forming against the background of delayed consolidation, taking into account the average time required for fracture healing
- tight — diagnosed in terms twice as long as usual
- necrotic — occurs after gunshot injuries against the background of impaired bone blood supply and in fractures with a tendency to form aseptic necrosis
- bone regenerate — cause — overstretching of a bone segment by an external fixation device
- true (nearthrosis, fibrous-synovial) — forms mainly in the humerus or femur. The fragments are covered with scar tissue with areas of cartilage, a cavity containing fluid, an articular capsule is visualized

Depending on the volume of bone substance, the characteristics of blood flow in the fracture zone, the following are distinguished:

- hypertrophic - bone growths grow at the ends,
- normotrophic - there is no fusion of bones during a fracture, the edges of the fragments have an unchanged appearance,
- atrophic - implies the absence of bone callus, accompanied by circulatory disorders.

The time of formation of a false joint depends on many factors: age, metabolism, localization and method of treatment (surgical or conservative) it coincides with the time of fusion in the norm of this type of fracture. A false joint after a fracture of the femoral neck, for example, as well as after a fracture of the shoulder neck, is formed in 5-6 months. In case of a rib or spine injury, about 4 months are required. A false joint of the shin or knee is formed faster.

Conclusion

The diversity of features of reparative processes occurring in the area of pseudoarthroses and bone defects is due to the fact that acute traumatic, ischemic, circulatory and inflammatory changes develop simultaneously in the damaged bone and paraosseous soft tissues.

Pseudarthroses and bone defects have morphological changes: periosteal and endosteal bone calluses are not expressed, consist of inflammatory granulation tissue, foci of necrosis and sequestration; in the underlying tissue, there is an accumulation of both lymphohistiocytic and polynuclear cells, only individual foci of bone formation in the form of bone sequesters are detected, which indicates low activity of osteoreparative processes.

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