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Zulfikar Patel

Associate Professor, Department of Orthopaedics, B.J. Medical College and Civil Hospital, Ahmedabad, Gujarat, India

Pratik Vala

2ND Yr Resident, Department of Orthopaedics, B.J. Medical College and Civil Hospital, Ahmedabad, Gujarat, India

Dhrumil Patel

1st Yr Resident, Department of Orthopaedics, B.J. Medical College and Civil Hospital, Ahmedabad, Gujarat, India

Corresponding Author:

Zulfikar Patel

Associate Professor, Department of Orthopaedics, B.J. Medical College and Civil Hospital, Ahmedabad, Gujarat, India

Clavicular fracture: Complications

Zulfikar Patel, Pratik Vala and Dhrumil Patel

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Abstract

The clavicle is easily fractured because of its subcutaneous, relatively anterior location and frequent exposure to transmitted forces. The middle third, or midshaft, is the thinnest, least medullous area of the clavicle, and thus the most easily fractured; the lack of muscular and ligamentous support makes it vulnerable to injury. It is often caused by a fall onto a shoulder, outstretched arm, or direct trauma. The fracture can also occur in a baby during childbirth.

The anatomic site of the fracture is typically described using the Allman classification, Group I (midshaft) fractures occur on the middle third of the clavicle, group II fractures on the lateral (distal) third, and group III fractures on the medial (proximal) third.

Keywords: Vascular, neurological complication, nonunion, malunion, posttraumatic arthritis, refracture

Introduction

It is estimated that fractures of the clavicle represent 4% of total human fractures, which are conservatively treated with Figure of 8 sling with good functional outcome. But because of relation of the clavicle with vital organs such as subclavian vessels, lung, brachial plexus, and heart, an injury to these organs may occur after a clavicular fracture.

Early complications

Vascular complication (Subclavian or carotid artery injury)

Neurological complications (brachial plexus injury)

Pneumothorax—hemothorax

Late complications

Nonunion, Malunion, Subclavian vein injury, ulnar neuropathy, Posttraumatic arthritis

Complications of surgical treatment, Refracture

Injury of Subclavian Vessels

The subclavian vessels injury is rare because of protection by the subclavius muscle, the Clavicle, the first rib, and the deep cervical fascia. After a clavicular fracture vascular injury occur at the proximal or middle part of the subclavian artery, where vertebral and thoracic arteries have their origin. Damage to the suprascapular artery, the axillary, and Carotid artery and internal jugular vein also occur after a clavicular fracture. Subclavian vein injury, due to its relation with the Clavicle via the cervical fascia, can also occur. About half of injuries to the subclavian arteries are because of the proximal part of clavicular fracture is dislocated superiorly by the sternocleidomastoid, causing damage to the vessel.

Late damage due to compression by a large callus or nonunion is rare. Vascular injuries include occlusion, traction constriction, or compression. Rupture of subclavian vessels may lead to life-dangering hemorrhage. While, arterial thrombosis or occlusion causes limb ischemia. The color and temperature of the upper limb can be normal, while the absence of pulse, the appearance of large hematomas in supraclavicular region, and the presence of a systolic bruit and palpable pulsatile mass should lead to the diagnosis of a Serious vascular injury. To exclude a Supraclavicular artery injury following are the criteria for doing Angiography comprise reduction or absence of radial artery pulses, Fracture of first rib, palpable hematoma in supraclavicular region, injury of brachial plexus and mediastinum widening in chest x-ray.

Angiography is the method of choice for the diagnosis of a subclavian artery injury.

The most common late vascular complication is compression of subclavian vein between the fractured clavicle and the first rib. Constriction of vessels can be complicated later with Thrombosis. Symptoms include distension of upper limb and anterior thoracic wall veins, which is minimized with downward shoulder movement. Venous thrombosis is not dangerous for limb viability but can Result in pulmonary embolism. Fractures of the proximal part of the clavicle can be complicated by carotid artery obstruction, caused either by compression from a fractured bony segment or by production of a large callus, causing Syncopal episodes

Pneumothorax—Hemothorax

There is direct relation of the middle part of the clavicle with the lung apex and pleura, which lead to pneumothorax or hemothorax occur from displaced clavicular fracture. These complications have been observed in

Very few patient of clavicle fractures, and the coexistence of scapular or upper ribs fractures should increase the risk of Pneumothorax- hemothorax. Treatment include conservative treatment ,drainage of the hemothorax and operative fixation of the fracture.

Brachial Plexus Injury

It is due to formation of an oversized callus that compress the branches of brachial plexus in the costoclavicular space. The distal segment of the fractured clavicle is displaced because of shoulder weight downward and backward, resulting in the formation of a callus which entraps the brachial plexus. Symptoms occur in weeks or years after a clavicular fracture in distribution of ulnar nerve. In hypertrophic nonunion, the distal fractured segment is displaced downward and backward, causing compression of the brachial plexus between the fractured segment and first rib. Direct injury can occur especially after a displaced or comminuted fracture of the middle part of the clavicle. The subclavius muscle, and the clavicle and its periosteum protect the brachial plexus. Acute lesions occur most commonly on the posterior branch of the brachial plexus. They present as neuroapraxia usually. In addition, brachial plexus can be avulsed over the clavicle or directly from the spinal cord. Acute injury of brachial plexus can also occur after immobilization of a clavicular fracture with figure-of-8 bandage or afeintramedullary fixation of the fracture with Kirschner wires.

Patients often complain of paresthesias or pain of the upper limb for a long time after the clavicular fracture. Symptoms are aggravated by abduction, external rotation of shoulder, weight lifting, which require the elevation of upper limb over the head, while symptoms subside with rest. Brachial plexus injury is diagnosed by history, physical examination, and the electromyography (EMG) and magnetic resonance imaging (MRI). Displacement of more than 1 cm in a simple x-ray result may suggest a brachial plexus lesion.

Nonunion of Fractures

Clavicular fracture nonunion is defined as the absence of obvious healing either clinically or radiologically 4–6 months after the injury. Most common site of nonunion is the distal segment of the fracture clavicle. Then comes middle part, proximal part have least chance of non union. Majority of middle part nonunions are symptomatic, causing mild to severe symptoms. Pain at the fracture site, which radiates to forearm, hand and neck, especially when the brachial plexus

is stimulated. Shoulder function with its range of motion is also affected. The atrophic nonunion may initially present with severe symptoms, But as time passes by, symptoms subside. Majority of distal clavicle nonunion are asymptomatic. Risk factors for the development of nonunion of a clavicular fracture : Fracture of distal part of clavicle, Displacement more than 2 cm (Most important factor) Refracture, Previous surgery, Inadequate shoulder immobilization, Severe injury of soft tissue.

Many nonunions result from severe injury to soft tissue structures, which in turn affect the vascularity of the site. Because of severe injury of the soft tissue, there is a decreased blood supply to the fracture site. Open fractures have a higher chances of nonunion. In cases of conservative treatment, shoulder immobilization should remain until complete healing is achieved. The period required for stabilization of fractures of middle shaft of clavicle is 2 weeks for the newborn, 3 weeks for children, 4–6 weeks for adolescents, and 6 weeks for adults. Diagnosis of nonunion is assessed clinically by the motion of the fractured end. Radiographically, it is confirmed with simple AP x-ray result with a cephalic projection of 45°.

Malunion

Healing of a clavicular fracture with a decrease in length by 2 cm, results in poor function and continuous pain in adults due to decrease in muscular strength of the shoulder. It seems that a decrease of clavicular length changes the glenoid position and results in restriction of Humeral head motion and scapular rotation during upper extremity movement. In children, the healing of the fracture with a decrease in length of the clavicle does not cause any severe trouble. Thanks to remodeling, children have the ability to restore the anatomical architecture of the bone.

Refracture

Refracture occur after the removal of an internal fixation plate. The plate should remain in place for at least 1 year, and any athletic activity should be avoided in the first 3 months after the removal. Alcoholism and comminuted fractures are risk factors of refracture. Clavicle refracture predisposes to nonunion.

Posttraumatic Arthritis

Posttraumatic arthritis usually appears in fractures with intra-articular extension into the acromioclavicular joint. In midshaft fractures, the decrease of the clavicular length alters the load on the acromioclavicular joint and results in late degenerative changes of the joint.

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