

TREATMENT OF VOLKMANN'S CONTRACTURE.

A REPORT OF TWO CASES WITH DESCRIPTION OF APPARATUS.

BY EMORY G. ALEXANDER, M.D.,

OF PHILADELPHIA,

Surgeon to St. Christopher's Hospital, Out-patient Department of the Episcopal Hospital,
and the Mary J. Drexel Home.

NEARLY forty years have elapsed since Volkmann first described a peculiar contracture of the hand, which he believed due to an ischæmia of the muscles from a cutting off of the arterial blood supply. He believed that the usual cause was too tight bandaging in the treatment of fractures, but also stated that the condition might follow injury to the blood-vessels, compression, or cold.

Volkmann thought the condition to be the result of a myositis and not to a primary nerve involvement, basing his belief on the fact that the paralysis and contractures appeared almost simultaneously, while the contractures following nerve injury were delayed.

Many articles on this interesting subject have been written, but little, excepting the treatment, has been added to the causes, clinical description, and pathology, as described by Volkmann.

The pathology of Volkmann's contracture is still a mooted question. Many follow Volkmann and believe the condition to be a contracture myositis; others, that it is primarily muscular in origin, but that there is a secondary nerve involvement, and still others believe that the nerves are primarily at fault.

Thomas, of Boston, in an excellent article on this subject, read before the American Neurological Society, says that if the nerves are involved in producing the muscle changes it is in the terminal muscle branches and that this is of secondary importance, and that "the involvement of part of a muscle only by the connective-tissue formation with a good response

to the remaining portion of the muscle to electrical stimulation," shows "that the nerve involvement in the primary process is not a necessary factor." The same author also calls attention to the frequent secondary involvement of nerve trunks in connective-tissue overgrowth. To this involvement Thomas thinks are due the disturbance of sensation, the reaction of degeneration and the atrophy of the hand muscles, as are seen in some cases of Volkmann's contracture.

The treatment for the contracture first recommended by Volkmann consisted in stretching the contracted muscles under an anæsthetic. The other methods that have been recommended consist in the gradual stretching of the muscles by means of a splint and by operation.

The operations devised are, freeing the nerves from connective-tissue formation, myotomy, and tendon lengthening, either by operating directly upon the tendons, or indirectly, by removing a portion of the bones of the forearm.

Volkmann believed his method applicable to recent cases, but in old cases with marked cicatricial changes there was danger of fracturing the bones or rupturing the tendons. In direct tendon lengthening, the disadvantages are the danger of infection, the length of time required to perform the operation, and the adhesions that sometimes form around the tendons. The deformity it produces, the weakening of the extensor muscles, and the liability of infection or non-union must be thought of before undertaking bone resection. Freeing the nerves and myotomy have both been practised with some success. Jones has discarded all operative measures and relies entirely upon "mechanical and manipulation routine." His reasons for so doing are that operative measures are "hazardous and inadequate," as any open operation must be performed through tissues deficient in circulation and usually cicatricial. He also states that after operation "almost immediate mechanical strain" is necessary to correct the deformity.

The following two cases were treated by mechanical means,

electricity, and massage. One case was of short duration, the other had existed for several months.

CASE I.—A. W., female, age six years, was admitted to the Children's Hospital of the Mary J. Drexel Home in February, 1912, with the following history:

In June, 1911, the patient fell down a flight of stairs and sustained a T fracture of her right elbow. The fracture was treated with an anterior right-angle splint. The splint was too small, and when first applied was tightly bandaged to the arm and forearm. This caused so much pain that the bandages had to be loosened. The fracture was treated with this splint for six weeks, and on its removal, besides having a stiff elbow, it was noticed that the patient had a Volkmann's contracture. The limitation of motion of the elbow rapidly improved, but the Volkmann's contracture grew steadily worse. When seen by us the child showed a well-marked Volkmann's contracture of the right hand with atrophy of the muscles of the forearm, especially the flexors. The small muscles of the hand also showed atrophy. No accurate tests were made, but there was diminution of sensation in the hand. The muscles were not tested for degeneration. The circulation of the hand was impaired. If the hand was flexed to a right angle the patient could extend the fingers.

The case was treated on a splint, which I shall describe later, electricity and massage were given every other day, and the splint gradually extended. At the end of twelve weeks the case was discharged from the hospital cured, with good supination and pronation of the forearm, flexion and extension of the wrist and fingers. We heard from the patient a few days ago and no contractures have recurred.

CASE II.—H. S., male, age ten years, came to the Children's Hospital of the Mary J. Drexel Home from a neighboring city with the following history:

Five days before admission sustained a fracture in the neighborhood of the elbow-joint. Reduction was attempted and an anterior right-angle splint applied. The patient stated that the splint was tightly bandaged to his arm. As a result of the tight bandaging the fingers became blue, cold, and numb. The patient suffered intensely the first night following the accident and gained no relief until the dressings were removed. On admission

to the Drexel Home, five days after the accident, the arm and forearm were greatly swollen. The forearm was dusky, cold, and showed numerous blebs. On the flexor surface of the forearm, just below the elbow, was a large superficial ulcer. An X-ray examination showed an unreduced supracondylar fracture of the left humerus with the usual displacement of the fragments. All dressings were removed, the arm elevated and placed on a pillow, and hot antiseptic dressings applied. The circulation gradually improved, and at the end of a week, all fear of gangrene having passed, an anæsthetic was administered and an attempt made to reduce the fracture and the arm placed in the Jones position.

The patient remained in the hospital one month and was then discharged and referred to the dispensary. At the time of discharge he showed no sign of a contracture. About two weeks after leaving the hospital, and six weeks after the injury, it was noticed that he had a Volkmann's contracture. As the patient was not under my care when first treated in the dispensary, I do not know the muscle and nerve condition at that time other than the nerve involvement was very marked, as the patient told me that he accidentally placed his hand on a hot stove and received a severe burn without feeling any pain.

This case was treated as Case I, and in about three months' time was able to flex and extend the fingers and wrist. Although the patient has good wrist and finger motion, he still shows atrophy of the muscles of the forearm and hand. Sensation in the hand is apparently normal. (Figs. 1 and 2.)

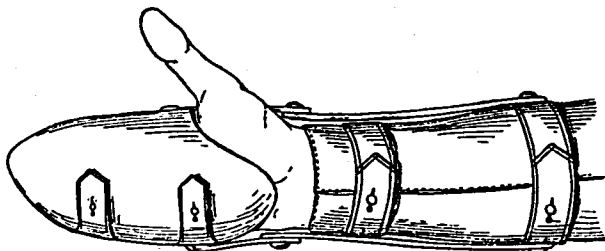
The only difficulty encountered in the treatment of these two cases was superficial pressure ulceration of the finger tips. This, I am sure, was due to faulty management and trying to produce too rapid an extension of the fingers. This difficulty we overcame by placing pads under the finger tips and "making haste slowly" with the extension.

Jones has noticed that, when the contracture has improved to such a degree as to permit hyperextension of the hand without a tendency to recurrence, the circulation will be found, as a rule, to have improved. He also claims that when the nerves are involved relaxation of the contracture is frequently accompanied by nerve improvement.

The apparatus used in treating the two cases reported consists of two parts.

Part 1 consists of a leather casing encircling the lower half of the forearm. The casing is reinforced on each side (radial

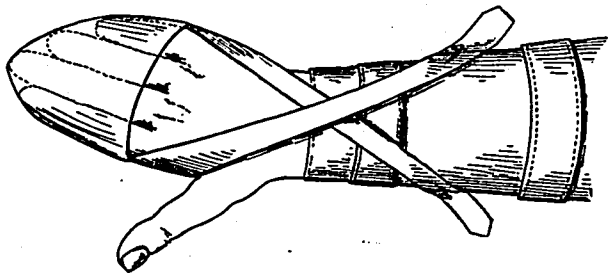
FIG. 1.



Palmar view.

and ulnar) by a steel bar. A semicircular bar at the upper end extends around the flexor surface from the radial to the ulnar bar. The casing is buckled on the extensor side of the forearm.

FIG. 2.



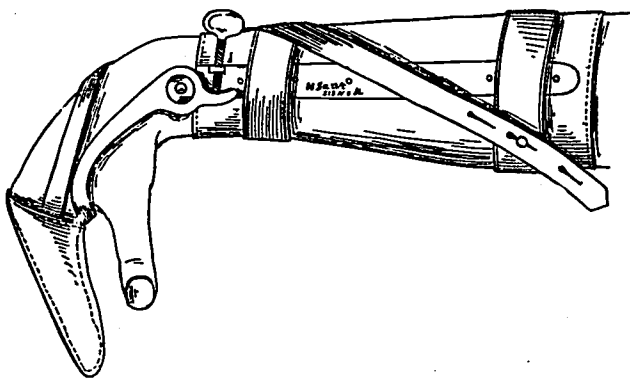
Dorsal view.

Part 2: A plate covered with leather is fitted to the palm of the hand and fingers. Extending from one side of the plate to the other, on the dorsal aspect, is a wide leather strap to hold the fingers straight and in position. Two bars attached in front on either side of the plate pass backward, the one on the radial side arching much more than the ulnar one, to join

at the wrist the radial and ulnar bars described in Part I. The joint formed by the union of these bars is provided with a lever and quick screw. Two long leather straps, attached in front at the junction of the plate and bars, pass backward, crossing on the dorsum of the wrist, and are attached to the radial and ulnar bars, just in front of junction of these bars with the semicircular one. These straps, and also the broad finger strap, are so arranged that they can be adjusted to fit the case.

The apparatus can be varied to suit the case. If much

FIG. 3.

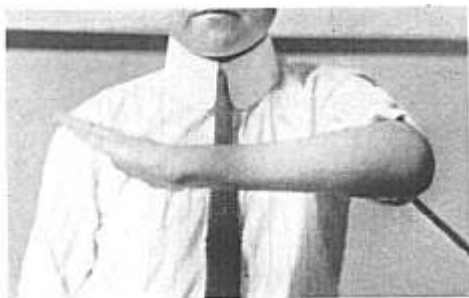


Lateral view.

trouble is encountered in preventing flexion of the wrist, greater fixation can be gained by having the leather casing buckled or laced on the flexor side of the forearm; if this is done the semicircular bar joining the radial and ulnar bars had best pass over the extensor side of the forearm. The long leather straps were not used in the first case, but in the second case they were found necessary to prevent the wrist from riding upward when extension was made on the fingers.

The apparatus is applied with the hand strongly flexed and the fingers extended as much as possible. By turning the screws the plate is elevated and the hand and fingers extended.

FIG. 4.



Case II. End result.

FIG. 5



Case II. End result—apparatus applied.