Intrinsic contracture of the hand after minor trauma

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ABSTRACT

A case of intrinsic contracture of a hand of an 18-year-old thin woman following an unrecognized mild trauma is presented. The moderate intrinsic tightness of the second, third, fourth and fifth fingers had been released from the metacarpal bones using the inter-osseous muscle sliding technique. After a 2.5 years follow-up period, no signs of recurrence were recorded and the functional outcome was favorable. Even a very mild trauma in slim patients may lead to hand edema which, in the long-term, could result in intrinsic muscle atrophy of the hand.

Key words: Intrinsic contracture, intrinsic muscles, surgical treatment

Introduction

Intrinsic contracture of the hand (intrinsic-plus hand) is mainly caused by ischemia, rheumatologic diseases, tumors, central nervous system diseases, spasticity and other iatrogenic causes [1-3]. Hyper-flexed metacarpophalangeal joints (MCP) and hyperextended proximal interphalangeal joints (PIP), because of the contracted inter-osseous and lumbrical muscles, are the main forms of presentation in the hand of intrinsic muscle contracture. Intrinsic tightness is defined usually by a less severe pattern of the disease in which PIP joint flexion deficit is still passively correctable. However, advanced forms of the disease prevent patients from grasping large objects and from maintaining their own hygiene [1-3]. Taking full patient history, robust physical examination, rheumatologic testing and electromyography (EMG) are important steps in reaching an accurate diagnosis. A positive intrinsic tightness test (Bunnell test) demonstrates contracture of the intrinsic muscles of the hand [1, 3]. It is generally performed through keeping the MCP joints in extension. When PIP joint flexion is reduced, it is then considered positive. Nonsurgical treatment is composed of stretching exercises, splinting and botulin toxin injections (in spasticity) for mild cases. However, surgical treatment is variable and usually determined by many factors; the etiology of the disease, the severity of the contracture and the residual muscle function [1-3]. The purpose of this report is to reveal the importance of early recognition and treatment of hand edema, even after a very mild trauma, to prevent intrinsic muscles contracture in thin individuals.

Case Report

An 18-year-old right-handed thin female presented to the authors’ outpatient clinic complaining of difficulty...
in grasping large cylindrical objects, loss of grip strength and hand deformity. Body mass index (BMI) was 15.1 kg/m². Her history revealed no obvious trauma, just that a friend of hers sat down on her right hand by an accident for a few seconds three months ago. She recognized a minor pain and swelling in her hand for a few days following the event. The swelling lasted for one week after which her hand had started to gradually worsen over the course of the next three months. The patient was initially treated conservatively with stretching exercises and splinting. However, no improvement had been noticed and her hand deformity continued to deteriorate.

Physical examination revealed a positive intrinsic tightness test (described by Bunnell in 1948) in the index, middle and ring fingers, whereas it was weakly positive in the little finger (Figure 1). Radiological examination showed a swan neck deformity at the index, middle and ring fingers (Figure 2). Psychiatric and neurological examination were performed to rule out any central nervous disease. EMG study of the upper extremities and rheumatologic testing were within the normal limits.

Physical examination uncovered existing weak muscle activity. As a consequence of the residual intrinsic muscle function of the hand, it was decided to perform a sliding inter-osseous muscle procedure under the Bunnell’s staged scheme. Through a dorsal transverse approach, the intrinsic tightness was released by sliding inter-osseous muscles from the metacarpal bones at the second, third and fourth inter-osseous spaces in 20.02.2012 (Figure 3). Postoperatively, the MCP joints were splinted in full extension to permit the origin of the muscles to heal in a more distal location. Following 3 weeks of splinting, one month of intensive physiotherapy was applied. After 2.5 years of follow-up, no signs of recurrence were detected and the functional outcome was favorable (Figure 4).

Discussion

The intrinsic contracture of the hand was first described by Finochietto [3]. After World War II, because
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of the encountering of a great number of intrinsic contractures of the hand, Bunnell had expanded the description of intrinsic deformities of the hand. The present incidence of reports of intrinsic contracture is lower than historical publications [1]. Nowadays, the lower observed incidence of intrinsic contractures may be from early prevention of compartment syndromes [1].

Initial reports related to the intrinsic contracture of the hand had suggested ischemia to be the main cause [3]. However, later on, many studies exhibited a diversity of etiologies, like trauma, compartment syndrome, injection injuries, infection, burns, rheumatoid arthritis, cerebral palsy, stroke, pain syndromes and iatrogenic lumbral plus finger (1-3). Hand edema may lead to fibrosis and adhesions of the intrinsic muscles together with their tendons. Pain may result from hand edema, usually forcing patients to decrease engaging in activities with their hand. Decreasing hand activities, in turn, may aggravate the situation [1]. Bilateral ischemic contracture of the intrinsic hand muscles was reported following a period of a prolonged immobilization in a mentally-disturbed patient [4].

As a rule, nonsurgical treatment should be continued until improvement is no longer expected. For most etiologies, three months of nonsurgical treatment should be attempted before surgical intervention [3]. For spastic patients, conservative treatment periods may last longer based on the fact that neurologic recovery for many diseases, like stroke and traumatic brain injuries, can occur even after 12 months [1-3].

Surgical options vary according to the cause, severity of deformity, duration of symptoms and the joints involved. Contractures involving the PIP joints alone and mild intrinsic contractures can be treated with just a distal intrinsic release (resection of lateral band). In chronic intrinsic contracture with swan neck deformity, the surgeon should also provide the stabilization of hyperextended and the lax PIP joint by intrinsic tenodesis, lateral band translocation or lateral band mobilization [1-3]. Contractures involving both the MCP and PIP joints are advised to be operated on by releasing the tendons more proximally [1-3]. If residual function of the hand intrinsic muscles is present, inter-osseous muscles need to be weakened by the inter-osseous muscle sliding technique [1, 3]. In the case presented here, the hand intrinsic muscles were detected to be partially working upon examination. That is why it was preferable to perform the inter-osseous muscle sliding technique. Inter-osseous tendon lengthening by a transvers palmar incision as an alternative to proximal inter-osseous muscle sliding is technically difficult and has a limited amount of lengthening [3]. In the case of total loss of hand intrinsic muscle function because of necrosis or severe spasticity, salvage options like proximal tenotomy of all inter-osseous tendons proximal to the MCP joint or ulnar neurectomy are recommended [1,5].

Although hand intrinsic muscle contracture is less frequently encountered than it once had been owing to the improved methods of prevention, it should still be considered in a patient even with a history of very mild trauma. The best measure against post-traumatic intrinsic contracture is limb elevation and proper splinting followed by digital-joint exercises [1]. Permanent edema causes serum protein accumulation in the muscles and results in consequent scar tissue formation [2, 3]. While splinting the hand, the wrist should be at 30 degrees of extension, the MCP joints at 70 degrees of flexion and the IP joints in full extension. In this position, the MCP collateral ligaments and the interphalangeal volar plates become tensioned and is known to prevent fibrosis of these structures.

Three cases of idiopathic hand intrinsic muscle atrophy in excessively thin young women were reported without any history of trauma [6]. It is assumed that intrinsic muscle contracture of the hand in thin young individuals may take place even after a very mild trauma.

This report highlights the need to consider early diagnosis and prevention of hand edema to thwart intrinsic muscle contracture in thin young individuals even after a very mild trauma.

Conflict of interest statement
The authors have no conflicts of interest to declare.

References
1. Kaufmann RA, Goitz R. Intrinsic contracture: diagnosis and management. Curr Opin Orthop 2005;16:231-5.
2. Paksima N, Besh BR. Intrinsic contractures of the hand. Hand Clin 2012;28:81-6.
3. Tosti R, Thoder JJ, Ilyas AM. Intrinsic contracture of the hand: diagnosis and management. J Am Acad Orthop Surg 2013;21:581-91.
4. McLardy-Smith P, Burge PD, Watson NA. Ischaemic contracture of the intrinsic muscles of the hands. A hazard of physical restraint. J Hand Surg 1986;11:65-7.
5. Hamada Y, Sairyo K, Hibino N, Kobayashi A. Correction of Severe Contracture of Intrinsic Plus Hand with a Modified Ilizarov Mini-Fixator: Correction with an Ilizarov Mini-Fixator for Severe Hand Contracture. J Hand Microsurg 2015;7:161-5.
6. Takai H, Hamada Y, Tonogai I, Hibino N. Locking of the metacarpophalangeal joint caused by idio-pathic intrinsic muscle atrophy of the hand: report of three cases. Hand 2012;7:431-4.