

## DIABETIC STIFF HAND SYNDROME / (DIABETIC CHEIROARTHROPATHY)

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### ABSTRACT

Diabetes mellitus (DM) is associated with several musculoskeletal disorders[MSD]. The incidence of MSDs in the diabetic patient have increased, resulting in the increased prevalence and clinical importance of musculoskeletal alterations in diabetic subjects. The exact pathophysiology of most of these musculoskeletal disorders remains obscure. Connective tissue disorders, neuropathy, vasculopathy or combinations of these problems, may underlie the increased incidence of musculoskeletal disorders in DM. The development of musculoskeletal disorders is dependent on age and on the duration of DM; however, it has been difficult to show a direct correlation with the metabolic control of DM. Most of these disorders can be diagnosed clinically, also some radiological examination may help, especially in differential diagnosis. No specific treatment is available, and treatments used in the general population are also recommended for diabetic subjects. Infectious complications affecting the musculoskeletal system are common in DM subjects, and these, possibly life-threatening, complications should be systematically discussed. Diabetic patients may suffer from a wide range of musculoskeletal disorders that can cause pain and some dysfunctions in the patient and affect the treatment negatively or reduce the quality of life by causing problems in the implementation of exercise programs, which are very important in the treatment of patients with Diabetes Mellitus. Although most of these problems are also seen in non-diabetics, they are more frequently observed but are not specific to diabetics. Their physiopathology is not fully understood; there is some evidence suggesting that macro and microvascular complications of diabetes are responsible. A diagnosis of musculoskeletal dysfunctions in diabetic patients is made by clinical findings, If the treatment of problems requires corticosteroid use, diabetes can be hard to manage. In this review, we summarized the general features, diagnosis, and treatment modalities of frequent and important musculoskeletal disorders in diabetic patients.

**KEYWORDS:** Diabetes, MSD, Vasculopathy, Micro vascular complications.

### INTRODUCTION

#### Definition

Diabetes stiff hand syndrome (DSHS) / Diabetic cheiroarthropathy is a painless disorder that can limit the hand functioning in patients with Diabetes. Which is a cutaneous condition characterized by limited joint mobility of the hands and fingers, leading to flexion contractures, It usually begins little finger later spread to the whole carpals of hand. This stiffness will not able to make fingers stretch. In addition the skin of your hand becomes thick, tight & waxy-looking.

- This condition is thought to caused due to the deposition of excess of collagen throughout the skin over limbs (hands in this case).
- Patients who develops DSHS suffer from an increased stiffness of hands, which can limit motility. This is most common disorder in patients with uncontrolled Diabetes for long periods (up to 30yrs) and have diabetic nerve damage (Neuropathy).



### Epidemiology

DSHS, Since the recognition of joint contractures in Juvenile diabetics with stature, it has become obvious that DSHS affects other groups type 1 DM with normal stature, adults with type 1 DM, & even some adults with type 2 DM.

- The prevalence of DSHS in DM varies from 38% - 58% type 1 DM to as high 45%- 76% to type 2 DM depending on the report.
- Most studies suggest a prevalence ranging from 30% - 40% indicating that DSHS is a common clinical entity. This musculoskeletal complications of DM may occur in individuals of any age & is quite common in adults, probably with a similar prevalence to that found in children.
- The onset of DSHS is insidious & may predate the recognition of overt Diabetes males & females appear to be affected by this disorder in similar proportions.

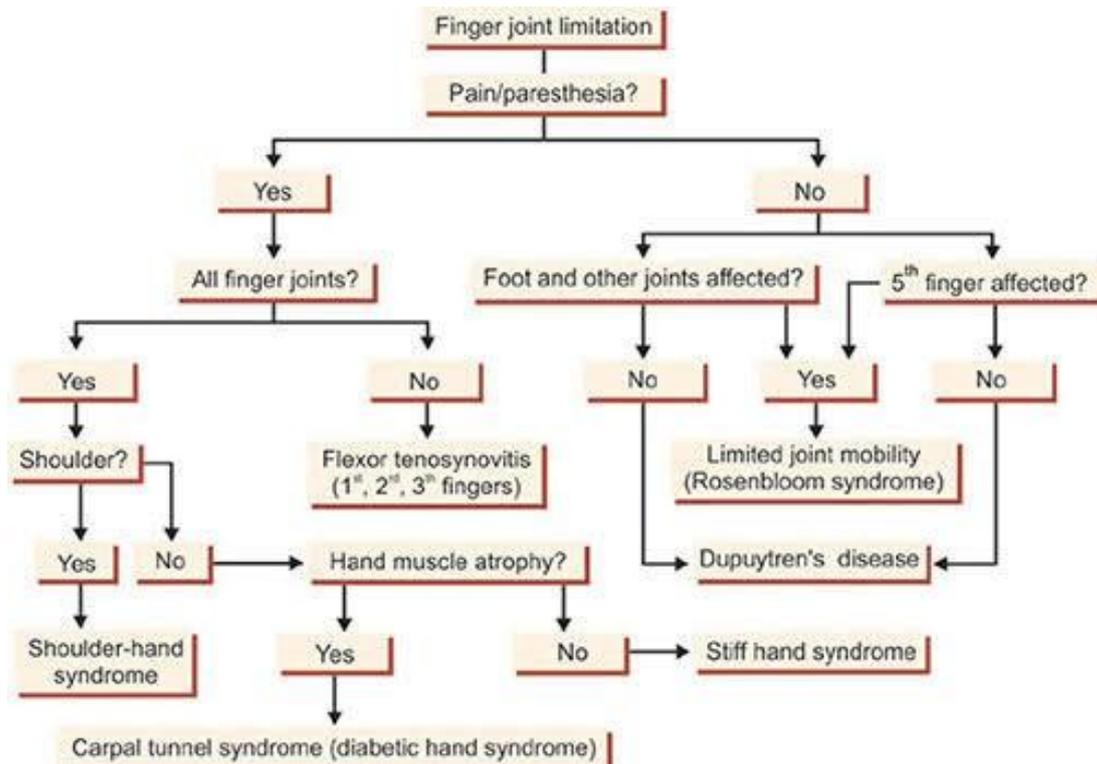
Although no racial differences have been described in those ethnic & racial groups with increased incidences of DM.

### Pathogenesis

The exact pathogenesis of DSHS is not fully known. Scientists are still unsure why diabetes increases the risk of hand complications.

- Possible theories for this condition appear to be related to the problem within the body's collagen. Collagen is the protein that makes up tendon, ligaments, joints and other connective tissue in the body. Increased collagen production and decreased breakdown and changes to the composition of collagen can lead to abnormal gathering of proteins in hand causing stiffness.
- Some claim that it is an microvascular complication.
- And other major suspects include the UNCONTROLLED DM & BLOOD SUGAR levels for longer periods of time.
- Proposed causes of cheiroarthropathy include increased nonenzymatic glycosylation of collagen, increased cross linkage of collagen and microangiopathy.

Altogether cause limited joint movement eventually.



Typical algorithm showing Limited joint mobility of fingers and their categorization based on the presence or absence of the complications.

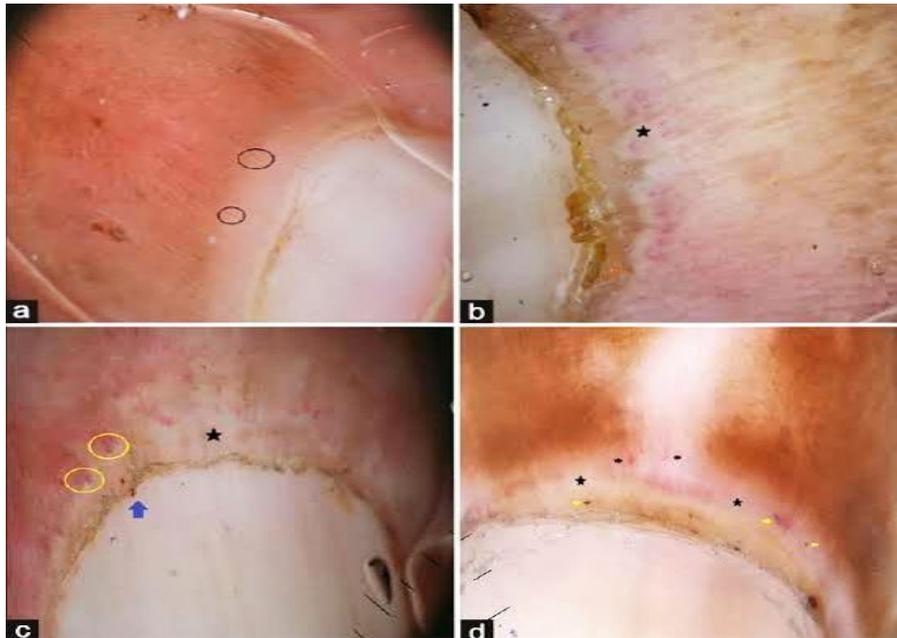
### Etiology

Multiple factors are thought to be related to the underlying cause of diabetic stiff hand syndrome. No specific, direct cause of Diabetic Stiff Hand Syndrome is known by the doctors. However a combination of factors is thought to cause the syndrome which includes:-

- Uncontrolled Blood glucose.
- Prolonged DM conditions.
- History of Limited Joint Movement Syndrome.
- Neglected Telangiectasia & Autoantibody attacks.
- Lifestyle criteria.
- Poor compliance.

### Symptoms

- Cutaneous changes around Metacarpophalangeal & Proximal interphalangeal joints.
- Changes in skin which becomes thick, rigid & waxy.
- Arterial calcification.
- Dermal thickening.
- Mucin deposition
- Tenolysis.
- Trigger fingers.(in few cases)
- Dermal atrophy.
- Nailfold capillaroscopic changes. (Notable microscopic change)



- Spiraling capillary loops with decreased density & apical dilatation.
- Joint contractures.
- Short stature.
- Painless, non-disabling.
- Limited hand movements.

### Diagnosis

As DSHS is usually simple to diagnose with the physical examination and the presented complaints by the patient but formally confounded with other MSD's (Musculoskeletal Disorders). As DSHS is so close to the exhibited symptoms as of the other MSD's.

Unique differentiation can be done by the following diagnostic methods:-

1. Raynaud's Phenomenon
2. Prayer's sign
3. Table top Test
4. Goniometry
5. Palm print test
6. Ultrasonography
7. X-ray

### PRAYER SIGN

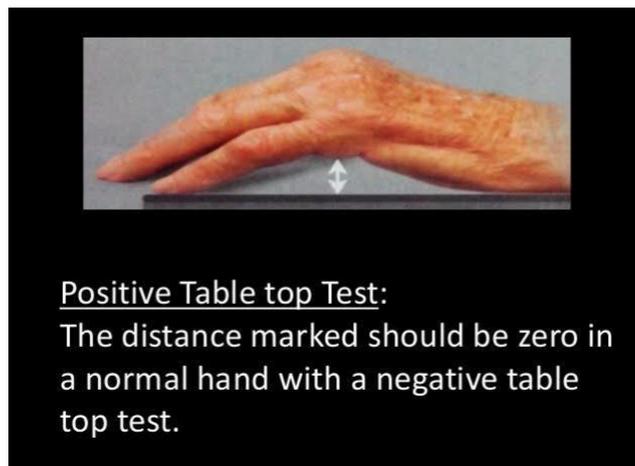
The "Prayer sign" indicates the presence of diabetic chiroarthropathy. It is characterized by patient inability to completely close gaps between opposed palms and fingers when pressing their hands together in prayer's position.



It also associated with thickness & stiffness of the underlying skin on the dorsum pebbled and rough over the interphalangeal joints, knuckles and periungual

regions. This condition is associated with and predictive of other diabetic complication like retinopathy, nephropathy, neuropathy & hypertension.

#### TABLE TOP TEST



A patient's inability to place their palm and fingers flat on a table is highly indicative of Dupuytren's contracture. Which is thought to be caused by palmar fascia thicknes to form a nodule and ligamentous structures of the digits. The cord then tighten and force the affected joint(s) into flexion.

A positive test occurs when the patient cannot flatten the palmar side of his/her hand onto the surface of a table.

#### GONIOMETR

The term **goniometry** is derived from two Greek words, *gonia*, meaning "angle" and *metron*, meaning "measurement".



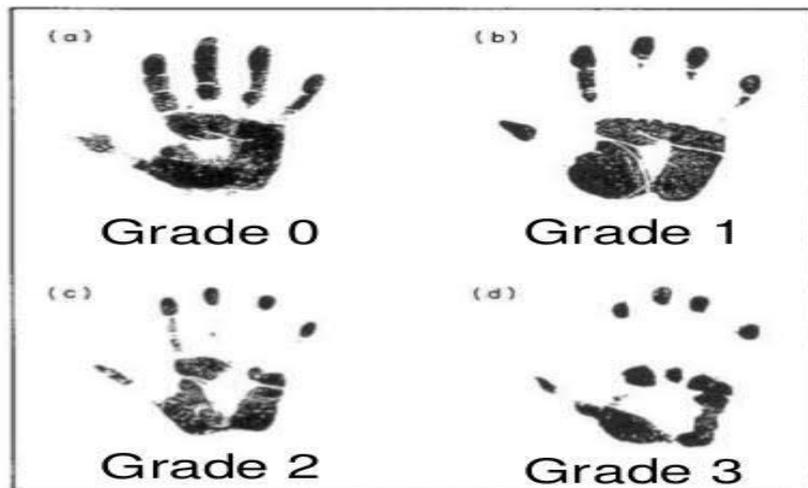
A goniometer is used to document initial and subsequent range of motion, at the visits for occupational injuries, and by disability evaluators to determine a permanent disability. This is to evaluate progress, and also for medico-legal purposes.

Standards states that 60 is the formal angle of the wrist bent during diagnosis, if the angle is more than 60 is said to be positive symptom of the stiff hand as the muscles and bones get stiff in the DSHS the patient

may not be able to bend or stretch the arms as formal person do.

#### **PALM PRINT TEST**

Patient's palms are painted with blue or black ink and asked to place the palms over the white paper or white background and should press over the paper or white background, accordingly the grades are given based on the areas printed, which are as follows:-



GRADE 0:- All phalangeal areas are visible.

GRADE 1:- Deficient interphalangeal areas of 4<sup>th</sup> & 5<sup>th</sup> digits.

GRADE 2:- Deficient interphalangeal areas of 2<sup>nd</sup> & 5<sup>th</sup> digits.

GRADE 3:- Only tips seen.

A DSHS person may not firmly press his palm over the white paper and evaluation can be ruled out.

#### **Treatment**

Treatment for stiff hands may include stretching exercises for the joints and muscles to help loosen them. Different types of splints or casts may be used to stretch the tight joints and regain more motion. Surgery may be needed if other treatments are not working or if the pain is affecting hand function. Any surgical procedure will

typically require significant hand therapy post-surgery. Without therapy, the stiffness may return.

Hand surgeon will help you decide the best approach for your individual situation. Success depends on the combined efforts of the surgeon, therapist and patient.

#### **Treatment options**

Treatment largely depends on the underlying cause of the stiffness, but it may involve:

#### **✂ Home care**

Ice or heat packs and over-the-counter pain medications, such as nonsteroidal anti-inflammatory drugs, can help relieve symptoms.

### ✂ Splints or casts

These can help stretch tight joints or keep bones in place.

### ✂ Steroids

Steroid injections may provide some relief, depending on the underlying cause.

### ✂ Enzymes

Certain enzymes may help break up knotted tissues.

### ✂ Surgery

In some cases, such as many cases of trigger finger, a person will need surgery and physical therapy.

### ✂ Stretches

Hand stretches are an important part of treatment, and they may help prevent or ease stiffness.

Various stretches can help promote a full hand function and range of motion. For example, authors of a 2017 study published in *BMJ Open* found that participants with rheumatoid arthritis had improved hand function after practicing hand exercises.

They also noted that while long term adherence to stretching exercises can be difficult, it is crucial for improving hand function.

Hand and finger stretches are not a replacement for treatment, but in many cases, they can be complementary.

Depending on the cause of stiffness, the doctor may recommend specific exercises. Always follow the guidance of a doctor or physical therapist.



Below, find a few examples of stretches for stiff fingers.

#### • Gentle fist

Practicing making a soft fist can help promote motion in the hand.

- ❖ Open the hand, spreading the fingers as far as possible.
- ❖ Make a gentle fist with the thumb over the rest of the fingers.
- ❖ Do not clench too tightly.
- ❖ Hold the position for 45 seconds.

- ❖ Repeat the process five times each day.

This should not cause pain and should help the hand feel more open and mobile.

#### • Finger flexing

This helps promote a range of motion in the tendons and muscles.

- ❖ Place the arm and hand flat on a table, with the palm facing up.
- ❖ Keeping the wrist straight, bring the fingers slowly toward the palm.

- ❖ Slowly release the fingers until they lay flat on the table again.
- ❖ Repeat the process 10 times.

- **Finger stretch**

- ❖ This stretches all of the fingers at once and may help improve the range of motion.
- ❖ Start with the hand flat on a table, with the palm facing down.
- ❖ Apply slight pressure, so that the fingers lie as straight and flat against the table as possible without forcing the joints or causing pain.
- ❖ Hold this for up to 60 seconds, then release the position.
- ❖ Repeat this five times each day.

- **Fingertip stretch**

This stretch promotes a range of motion in the tips of the fingers.

- ❖ Hold the hand vertically, with the palm facing toward the body.
- ❖ Bring the fingertips down, so they touch the top of the palm.
- ❖ Hold this position for 30 seconds, then release it.
- ❖ Repeat this five times daily on each hand.

Doctors may also recommend exercises with grip and pinch strengtheners. These are soft, springy balls or putty that provide some resistance when the person squeezes or pinches them.

- ❖ Squeeze a grip strengthener as hard as possible without causing pain.
- ❖ Hold this position for a few seconds at a time, before relaxing.
- ❖ Repeat this 10–15 times per day.
- ❖ It may be a good idea to alternate hands on different days, to allow each hand to rest.
- ❖ Pinch a softer pinch strengthener between all five fingers as hard as possible without causing pain.
- ❖ Hold the pinch for up to 30 seconds before releasing it.
- ❖ Repeat this up to 15 times per day.
- ❖ Try alternating hands on different days, to allow each hand to rest.

Exercising with these tools is important to increase strength in the muscles of the hands and fingers.

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