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# Approach to Osteoarticular Disease in People with Diabetes

**D**iabetes mellitus (DM) is a highly prevalent chronic metabolic disease, posing a significant challenge for Public Health. In both Type 1 Diabetes Mellitus (T1DM; an autoimmune disease characterized by the destruction of beta cells in the pancreatic islets) and Type 2 Diabetes Mellitus (T2DM; characterized by defects in insulin secretion or

insulin resistance along with environmental, genetic, and other factors), the metabolism of proteins, fats, and carbohydrates in insulin-targeted tissues is affected, which compromises various organs, leading to well-known diabetes complications: retinopathy, neuropathy, nephropathy, cardiovascular disease, and, more recently recognized, diabetic bone disease.

The increased risk of fractures in people with diabetes, along with joint mobility impairment, can affect and/or limit activities of daily living. This fact is particularly relevant considering the association of diabetes mellitus (DM), especially T2DM with aging (its prevalence increases with age), overweight/obesity/visceral adiposity, sarcopenia (loss of muscle mass, strength, and function), and other metabolic disorders, all of which are recognized as factors contributing to joint disease.

**Several rheumatological diseases have a higher prevalence among people with diabetes. On the other hand, DM is one of the endocrine diseases with musculoskeletal signs and has the highest prevalence of locomotor system involvement, primarily in processes affecting the hands and shoulders.**

The mechanisms through which damage or impairment occurs are complex, involving non-enzymatic glycosylation of collagen with the formation of advanced

glycation end products (AGEs), which cause an increase in collagen cross-linking and a more extensive accumulation of AGEs in tissues with low-turnover proteins, such as collagen in the extracellular matrix of the joint capsule, ligaments, and muscle-tendon units. **However, the association with disease duration and poor glycemic control is clear, with osteoarticular disease acting as a predictor of other micro- and macrovascular complications.**

Functional deterioration and limitations in everyday activities associated with osteoarticular involvement in people with diabetes, coupled with the significant economic cost, require a focus on prevention, treatment, and metabolic control to improve quality of life. Annual check-ups should include personal and family factors related to fracture history and mobility limitations. Additionally, it is essential to assess not only for potential neuropathies but also for joint functionality, and to promote targeted nutritional habits (vitamin D-rich foods and

diets high in antioxidants), with a strong emphasis on obesity prevention and treatment. Other key components include fall prevention and addressing other geriatric syndromes related to aging, as well as stretching, strengthening, balance, and physical exercise programs to prevent and reduce joint stiffness. Physical therapy programs may provide only short-term improvement. In surgical treatments, where outcomes are equally satisfactory as in people without diabetes, care must be taken with soft tissues in people with diabetes to avoid complications such as devitalization, delayed healing, necrosis, and inflammation. Anamnesis and physical examination are crucial since most diagnoses are clinical. A multidisciplinary approach is fundamental, and screening for diabetes in certain common osteoarticular pathologies could also be integrated into this person-centered approach.

The most significant osteoarticular signs in people with diabetes can be classified as follows: »

DM-RELATED OSTEOARTICULAR SIGNS		JOINT OR AREA AFFECTED
SYNDROMES WITH LIMITED JOINT MOBILITY	Diabetic cheiroarthropathy. (Rigidity syndrome in DM).	MCP and PIP joints of the hands.
	Dupuytren's contracture.	4th flexor tendon most frequently affected
	Stenosing flexor tenosynovitis (trigger finger).	Flexor tendons of the hands.
	Adhesive capsulitis or frozen shoulder.	Shoulder.
NEUROLOGICAL SYNDROMES	Charcot neuroarthropathy	Feet, ankles
	Carpal tunnel syndrome.	Wrist.
	Diabetic amyotrophy or lumbar polyradiculopathy.	Pelvic girdle and thigh.
MUSCULAR SYNDROMES	Muscle infarction.	Not specified
SKELETAL SYNDROMES	Osteomyelitis	Feet, lower extremity joints
	Altered bone mineral density: osteoporosis	Not specified
	Arthritis	Not specified
	Diffuse idiopathic skeletal hyperostosis (DISH or Forestier's disease)	Thoracolumbar spine



PHOTO 1

PHOTO 2

PHOTO 3

**PHOTO 1: Prayer sign in diabetic cheiroarthropathy.** Source: Soto-García D, Peón G et al. Prayer sign in diabetic cheiroarthropathy. *Medicina Práctica* 5, 2022. DOI: 10.1016/j.mcpsp.2022.100320

**PHOTO 2: Table sign in diabetic cheiroarthropathy:** the hand does not touch the surface of the table due to existing joint contracture. Source: Proubasta I. The diabetic hand. *Rev Iberoam Cir Mano*, 2015; 43: 135-141.

**PHOTO 3: Dupuytren's disease.** Source: Proubasta I. The diabetic hand. *Rev Iberoam Cir Mano*, 2015; 43: 135-141.

» **Cheiroarthropathy:** Also called DM-related Stiff Hand Syndrome, requires differential diagnosis with entities such as scleroderma. It has a prevalence of 8% up to 50% in people with DM vs 4% up to 20% in those without DM. It consists of thickening and hardening of the skin, usually on the dorsum of the hand, along with thickening of the flexor tendon sheaths of the fingers. This results in finger stiffness and reduced manual dexterity. On physical examination, typical signs are observed, caused by the inability to fully straighten the metacarpophalangeal joints: the prayer sign and the tabletop sign. Early recognition is important as it represents a marker for other diabetic microvas-

cular complications (nephropathy, retinopathy, and peripheral neuropathy).

**Dupuytren's Contracture:** Its prevalence ranges from 15% up to 40% in people with DM, and its incidence increases with age and the duration of DM. It is characterized by fibrosis, nodule formation in the palmar aponeurosis, and subsequent contracture of the palmar fascia and flexor tendons. In individuals with DM, the third finger is more commonly affected, progression is slower, and while the 5th finger is less frequently involved, its presentation is more severe. »

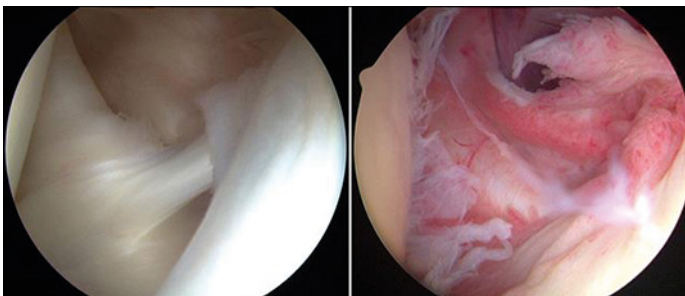


PHOTO 4

PHOTO 5

**PHOTO 4: Frozen shoulder:** hardening of the soft tissues in the shoulder capsule causes stiffness and inflammation. Source: OrthoInfo from the American Academy of Orthopaedic Surgeons, available at: <https://orthoinfo.aaos.org/es/diseases--conditions/hombro-congelado-frozen-shoulder/>

**PHOTO 5: Arthroscopy:** joint lining of a normal shoulder (left) and an inflamed joint lining damaged by frozen shoulder (right). Source: OrthoInfo from the American Academy of Orthopaedic Surgeons, available at: <https://orthoinfo.aaos.org/es/diseases--conditions/hombro-congelado-frozen-shoulder/>



**PHOTO 6: Charcot neuroarthropathy:** varus deformity of the hindfoot causing a pressure area on the lateral malleolus, along with a radiological image showing established arthritic changes with loss of talonavicular relationships. Source: Muñoz-De-La-Calle JF, Viadé-Julia J. Charcot arthropathy in diabetic patients. Review of Current Concepts. Rev Colomb Ortop Traumatol, 2020; 34:5-15.

» **Stenosing Flexor Tenosynovitis (Trigger Finger):** The prevalence is 5% up to 20% in people with DM, with a higher frequency of bilateral presentation and/or involvement of multiple fingers simultaneously, related to the duration of diabetes. It involves thickening of the flexor tendon and the formation of a nodule in the tendon sheath, which is palpable near the metacarpophalangeal joint. This condition causes the finger to lock in flexion (commonly known as trigger finger), producing a characteristic snapping sound during examination and pain during passive extension. The 1st, 3rd, and 4th fingers are most widely affected. Imaging or laboratory tests are rarely required for diagnosis.

**Adhesive Capsulitis or Frozen Shoulder:** Its prevalence is around 20% in people with DM, who tend to present more severe symptoms, with greater bilateral involvement and a poorer response to treatment. It is characterized by pain, stiffness, and global functional impairment of the glenohumeral joint. Physical examination reveals reduced active and passive joint mobility in 2 or more planes vs the unaffected shoulder, with external rotation and abduction being most affected. Diagnosis is primarily clinical, although imaging may be necessary to differentiate it from other causes of shoulder pain.

**Charcot Neuroarthropathy:** Primarily affects the joints of the foot, tarsus, and ankle in people with DM who have sensory neuropathy, typically asymmetrically (20% may be bi-

lateral), with prevalence increasing with the duration of DM. It is a refractory process to various treatments, emphasizing the importance of early intervention following clinical suspicion (along with the use of proper footwear to prevent micro-lesions). Treatment combines joint offloading techniques with management of complications (bone fractures, amputations, ulcers) and surgery.

In the first stage (inflammatory phase, 3 to 4 months), it may occur without pain, with difficulty walking due to excessive joint mobility, sometimes associated with minor trauma. Clinical suspicion is critical in a person with long-standing DM and poor metabolic control who presents with unilateral foot swelling and edema, mild or absent pain, and joint deformity and instability (caused by synovial pouch damage and ligamentous laxity, leading to subluxations and dislocations). Peripheral neuropathy is always associated.

In the second stage, pain disappears or improves, and deformities emerge. This is the coalescent phase, dominated by reparative phenomena (cartilage and bones deteriorate, synostoses and deformities develop). Skin lesions may occur in both stages. Simple X-rays can show osteoporosis, subluxations, osteolysis, fractures, and periosteal reactions depending on the disease stage. For early differential diagnosis, CT scans, MRIs, or bone scans can be useful.

**Carpal Tunnel Syndrome:** Present in 25% of DM cases, it is caused by compression of the »

IN CHARCOT  
NEUROARTHROPATHY,  
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IMPORTANCE  
IN ITS MANAGEMENT  
DUE TO THE  
COMPLEXITY  
AND INTERPLAY  
OF MULTIPLE  
ETIOLOGICAL AND  
CLINICAL FACTORS  
THAT CONDITION  
ITS TREATMENT



## OSTEOARTICULAR DISEASE IN PEOPLE WITH DIABETES, PARTICULARLY IN THOSE WITH LONG-STANDING DISEASE, SHOULD BE IDENTIFIED IN PRIMARY CARE. IN MOST CASES, DIAGNOSIS IS CLINICAL, AND METABOLIC CONTROL IN DIABETES PLAYS A FUNDAMENTAL ROLE



» median nerve. The pathogenesis is dual: on one hand, it falls within syndromes limiting joint mobility, with connective tissue changes; on the other hand, diabetic polyneuropathy caused by microangiopathy increases the median nerve susceptibility to compression and injury. Symptoms, diagnosis, and treatment do not differ from non-DM individuals, except for pain resolution in DM patients after surgery, often linked to the progression of neuropathy.

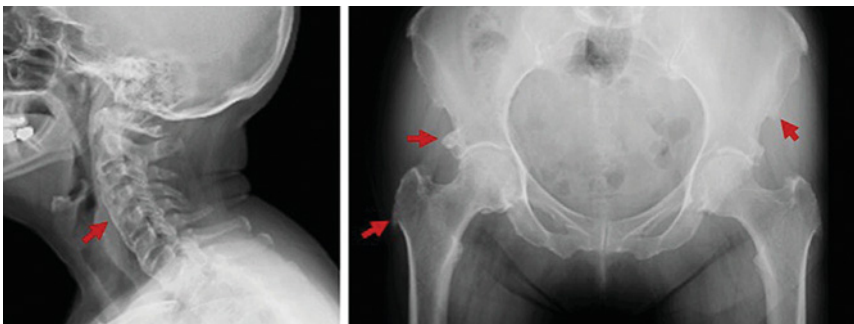
**Diabetic Amyotrophy:** A rare condition affecting < 1% of people with DM (more common in T2DM sometimes preceding diagnosis). It has a multifactorial, poorly understood etiology, with clinical and exclusion-based diagnosis. It presents with acute/subacute intense pain, weakness, and muscle atrophy, uni- or bilaterally in the pelvic girdle and thigh, with functional and sensory deficits. Prognosis is favorable with treatment.

**Muscle Infarction:** A rare disease associated with long-standing DM with microvascular complications. It shows as acute thigh pain (commonly affecting the vastus lateralis and medialis of the quadriceps) with weakness and a painful, palpable mass followed by inflammation and induration of adjacent tissues, leading to functional impairment. Diagnosis is based on clinical and radiological criteria (MRI).

**Osteomyelitis:** The most common infection associated with diabetic foot ulcers, with severe consequences such as major or minor limb amputation.

**Osteoarthritis (OA):** Meta-analyses confirm an association between T2DM and OA. The synovial membrane in people with T2DM-related OA shows characteristics of insulin resistance. Metabolic diseases have a direct systemic effect on joints beyond the common pathogenic mechanisms of metabolic »

## HAND INVOLVEMENT IS PRESENT IN APPROXIMATELY 30% OF PEOPLE WITH DIABETES AND INCLUDES: CARPAL TUNNEL SYNDROME, DUPUYTREN'S CONTRACTURE, FLEXOR TENOSYNOVITIS, AND DIABETIC CHEIROARTHROPATHY OR HAND STIFFNESS SYNDROME



**PHOTO 7: DISH:** 71-year-old woman with DM, with pain lasting 4 years and cervical-dorsal limitation. Radiographic findings: (A) cervical, bone bridges from C2-C7 (red arrow); (B) pelvic, bony excrescences at the entheses of the iliac spine, acetabulum, and greater trochanter of the femur (red arrow). Source: Quintero-González D et al. Clinical-radiological characteristics of diffuse idiopathic skeletal hyperostosis in 2 medical centers in Cali, Colombia: report of 24 cases. *Rev Colomb Reumatol*, 2020; 27:80-87.

» diseases and OA (low-grade inflammation and oxidative stress). This includes and highlights the interrelationship of obesity and metabolic syndrome.

**Diffuse Idiopathic Skeletal Hyperostosis (DISH or Forestier's Disease):** A non-inflammatory disease characterized by bone growth at tendon, aponeurosis, synovial bursa, or fibrous ring insertion sites, frequently in spinal ligaments and entheses of the extremities. Most patients remain asymptomatic until advanced stages, when pain and limitation become characteristic. **D**

### CONCLUSIONS

It is essential to recognize early the limited range of joint movement in people with diabetes—especially in older individuals—along with the onset of pain and loss of mobility. This should be a healthcare priority given the high prevalence of DM and its associated osteoarticular involvement, which correlates with disease duration and metabolic control in DM. Osteoarticular disease serves as a predictor of other micro- and macrovascular complications. Preventive interventions, teamwork, and early attention are crucial to slowing the progression toward disability associated with osteoarticular disease.

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