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Prevalence of Carpal Tunnel Syndrome and Flexor Tenosynovitis in Diabetes Mellitus in Faisalabad

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Abstract: *Type 1 and Type 2 diabetes are becoming more common in the world. Many people suffer daily from what they have been told is carpal tunnel syndrome. As a result of their pain and disability. While musculoskeletal symptoms of diabetes are frequent and, while not life-threatening, are a major source of morbidity, pain, and disability, vascular consequences of diabetes are widely known and primarily responsible for mortality and morbidity from the illness. Peripheral joints and the axial bone are among the joints that are impacted by diabetes. The peripheral neuropathy condition Charcot neuroarthropathy is a significant contributor to deformity and amputation. Known fibrosing diseases of the hands and shoulder include carpal tunnel syndrome, adhesive capsulitis, tenosynovitis, and limited joint mobility. Gout and Osteoporosis are more common among diabetics. Early detection and strong communication between experts in diabetes and rheumatology are essential for the management of both disorders.*

Key Words: Type 1 Diabetes, Type 2 Diabetes, Tunnel Syndrome, Flexor Tenosynovitis

Introduction

A frequent chronic compressive neuropathy of the hand affecting the median nerve is called CTS. Diabetes mellitus caused by CTS can also develop suddenly as a result of trauma, coagulopathy, inflammation, or infection, however, this is less usual. Without any prior injuries, pyogenic flexor tenosynovitis caused acute carpal tunnel syndrome with fast development and course that resembled necrotizing fasciitis. At the very least, they have to work with a modified or light-duty work assignment. Some individuals with carpal tunnel syndrome have tolerated their symptoms for so long that taking pills when they wake is automatic. There are even those people who believe their problem has subsided because the pain has stopped, which is an incorrect conclusion resulting from the brain adapting to a chronic problem. Carpal tunnel syndrome (CTS) is a problem with the nerves, muscles, and joints. This category of problems is usually referred to medically as musculoskeletal or neuromusculoskeletal problems. CTS is currently one of the most common healthcare problems today. From an economic point of view, this problem is huge. For example, carpal tunnel syndrome (CTS) is one of the most common problems, and the hardest to diagnose and treat. Some reports tell us that it costs $30,000 to treat a case of CTS (Tosti, & Ilyas, 2012).

Approximately 387 million individuals worldwide have diabetes mellitus. Over 50 million persons in Europe are thought to have diabetes, with a prevalence of 7.9%, and an additional 17.2 million are thought to be undiagnosed. Type 2 diabetes (T2D), which is represented by varying degrees of insulin resistance and insufficiency, affects around 90% of people with diabetes. The death of the beta cells that produce insulin characterises type 1 diabetes (T1D), an autoimmune illness that causes chronic insulin insufficiency. T1D is growing in wealthy nations at a rate of about 4% each year. The U.S. Department

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of Labor reported the annual cost to treat CTS is about $5,000 per patient. Some reports currently tell us that treating a case of CTS can average between $6,000 and $10,000, depending on whether one or both arms are involved. It's a bold statement, but we believe that if these problems were treated as described in this book, it would be possible to balance California's budget. (Rouxel et al., 2017).

Diabetic Neuropathic Arthropathy (Charcot Neuroarthropathy)

According to estimates, peripheral neuropathy affects almost half of all diabetic patients. Loss of protective feeling brought on by peripheral neuropathy may increase the risk of developing foot ulcers. The intrinsic muscles of the feet may atrophy as a result of distal motor neuropathy, resulting in claw toe deformity. Calluses may then form over the metatarsal heads, which are now bearing weight, and additional collapse of the midfoot arch exacerbates the deformity and handicap. Charcot neuroarthropathy is a rare complication of severe diabetic peripheral neuropathy (Waris et al., 2021).

In 1868, Jean-Martin Charcot was the first to present an in-depth description of arthropathy linked with neuropathy in a patient with tabes dorsalis. The ankle, metatarsophalangeal, and tarsometatarsal joints are the most commonly affected by neuroarthropathy linked with diabetic neuropathy. This distribution distinguishes diabetic neuroarthropathy from tabes dorsalis, which commonly affects the knee. (Jääskeläinen et al., 2015).

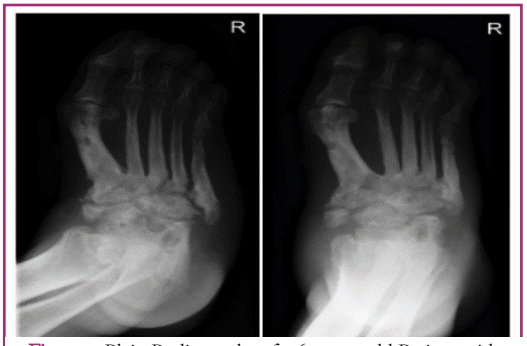

Figure 1: Plain Radiographs of a 67-year-old Patient with Right Ankle and Foot Diabetic Neuroarthropathy Demonstrate Swollen Soft Tissues, Broken Bones, Fragmentation, and Destruction. There is some Sclerosis as Well.

It is believed that neuropathy of the sympathetic fibres, which increases blood supply to the subchondral bone and, in turn, increases osteoclastic activity, bone resorption, fragmentation, and disintegration, is the primary pathophysiology of this illness (Figure, 1). According to one theory, advanced glycation end-products (AGE) attach to chondrocyte RAGE, which increases matrix metalloproteinase and causes further damage and degeneration. Inflammation and accelerated atherosclerosis are considered to be caused by an increase in RAGE receptors in diabetes (Luna et al., 2012).

The major goal of therapy is to keep the plantigrade foot stable and free from infection and ulceration. This can be challenging to do, even with competent podiatry, the use of specialist footwear, and orthoses. It's crucial to keep the afflicted joint free from weight bearing until the erythema and oedema go down and the radiologic appearance improves. The temperature differential between the legs can help track the progression of the illness. Air-cast boots or complete contact casting might be employed to immobilise the patient. Although certain clinical studies have advocated the use of intravenous bisphosphonates, systematic evaluations contend that there is inadequate support for such a practice. The midfoot is less likely to be impacted than the ankle and rear feet, and the deformity can be difficult to repair and increase the risk of skin ulcers in individuals who arrive late in the illness. With the exception of debridement or amputation in situations of severe infection, surgical intervention has nothing to offer in the treatment of the Charcot's joint.

Metabolic Syndrome and Gout, Hyperuricaemia

Metabolic syndrome and obesity are risk factors for the progression of T2D. Age, BMI, smoking, family history of T2D, alcohol use, dietary additives, and the presence of specific metabolic syndrome components were all taken into account, and the multivariate risk for T2D among men with gout at baseline increased to at least one.34 [95% CI: 1.09-1.64]. According to these figures, men with gout had a higher risk of

developing type 2 diabetes in the future than men at high cardiovascular risk, regardless of other recognised risk factors (Rho et al., 2016).

Co-occurrence of Rheumatoid Arthritis and T1D

Rheumatoid arthritis and type 1 diabetes co-existing (T1D) it's well-known that people with RA are more likely to develop T1D, and vice versa. However, this association only seems to hold true for RA patients who have anti-citrullinated peptide antibodies that are positive, according to a recent Swedish study. In T1D individuals who go on to acquire RA, a particular variant, 620W PTPN22, was shown to increase risk. This allele may reflect a shared route between the two autoimmune.

Diffuse Idiopathic Skeletal Hyperostosis

Forestier's infection, also known as diffuse idiopathic skeletal hyperostosis (DISH), was assumed to be restricted to the axial skeleton at first. However, it is now recognised that the condition also produces bony prominence hyperostosis and ossification of tendon and ligament attachments in both spinal and extraspinal locales (figure 2). Diabetes affects around half of the DISH patients, and it is more common in elderly diabetics (Mori et al., 2017).

There is no evidence linking DISH incidence or severity to glycemic control or the presence of other diabetic complications. DISH can also present as back pain and stiffness or even dysphagia from exostoses. Many patients with DISH may be asymptomatic, however, the disorder can also be seen on routine imaging and cause these symptoms. Atlanto-axial subluxation has been observed in DISH. While extended use of anti-inflammatories is not recommended because of the hazards to the kidneys and the heart associated with these treatments in diabetes patients, physical therapy and anti-inflammatory medications may also help with symptom relief and function. A physical therapist, chiropractor or massage therapist should actually perform the treatment. How wonderful that a disabled person with constant acute pain is now living pain-free. And, we never saw this patient! If our treatment is so simple that a massage therapist can learn it from an E-mail, why are other healthcare providers not using our technique? There are two parts to this answer. First, doctors diagnose carpal tunnel syndrome as a problem originating in the hand. The pain, weakness and tingling all are located in the hand. There is swelling in the hand. Often, there is compression of the nerve in the wrist (the median nerve at the flexor retinaculum). However, our research has shown that carpal tunnel syndrome is usually caused by muscle spasms at the front of the shoulder. A similar example is when a pregnant woman has to swell in her ankles. The weight of the fetus on the pelvis compresses blood vessels causing decreased circulation and swelling which is then pulled down to the ankles by gravity. Likewise, tightness on the front of the shoulder puts pressure on blood vessels, thereby decreasing circulation. Since the pressure decreases the efficiency of the circulatory system in the arm, gravity keeps excess fluid in the wrist, which we see as swelling. It is the swelling in the hand that creates a bottleneck and compression of the median nerve. This spasm also puts pressure on the nerves at the front of the shoulder. Medical tests such as X-rays cannot identify muscle spasms in the front of the shoulder. Anti-inflammatory medication may help. Painkillers will decrease the pain allowing the patient to work and function more normally. A surgical release that cuts the ligament that we have been talking about decreases pressure on the nerve and helps the overall problem. However, if part or all of the original problem originated at the shoulder, all of these treatment techniques will either fail or have poor results. The second reason why healthcare providers do not utilize our technique is that our treatment requires considerable time and labour on the part of the healthcare provider.

Past generations did not suffer as we suffer today. Why is this? Probably the largest factor is that workers of the past performed a broad range of work activities that involved a diversity of work postures and a wide range of movements. Today's 'static' work posture and highly specialized, repetitive work environment create a high occurrence! Although many researchers have

postulated that CTS is primarily a result of repetitive movements, this is only part of the problem. If the shoulders are elevated by a fraction of an inch, muscles are supporting the weight of the shoulder and arm, rather than the joint and ligaments. If the shoulder is not elevated, even if the shoulders are not moving, the tension in the muscles forces the muscles to do (physiological) work. This invisible work fatigues the muscles creates muscle spasms, decreases circulation and may eventually shorten the muscle with fibrous tissue. Holding a piece of paper in front of you doesn't sound like much work, but don't forget about the weight of the arm. Think of your arms like a wrench or lever. Loosening a tight bolt requires less work with a longer wrench. Similarly, there's a huge difference in the amount of work a person does when moving an object out at arm's length. If you pick up a heavy book with both hands and hold it close to your chest you can hold the position without much difficulty. Now hold a book out at full arm's length for a couple of minutes and your arms will shake with fatigue.

Figure 2: Radiograph with T2 and DISH. On the right side of the middorsal spine, there are four consecutive vertebrae with bridging osteophytes.

Fibrosing Syndromes

Carpal tunnel syndrome, Dupuytren's contracture, adhesive capsulitis of the shoulder, trigger finger/thumb tenosynovitis (discern three), long abductor and rapid extensor of the thumbs (De Quervain's tenosynovitis), as well as diabetic stiff hand syndrome, are examples of severe fibrosing disorders. Anti-inflammatory medication may help. Painkillers will decrease the pain allowing the patient to work and function more normally. A surgical release that cuts the ligament that we have been talking about decreases pressure on the nerve and helps the overall problem. However, if part or all of the original problem originated at the shoulder, all of these treatment techniques will either fail or have poor results. The second reason why healthcare providers do not utilize our technique is that our treatment requires considerable time and labour on the part of the healthcare provider. Our technique is a money-saving technique, not a money-making technique. With it, massage therapists or physical therapists are required to provide 30 minutes of hands-on care. It's easy to understand that healthcare providers can see more patients by simply dispensing medicines rather than by dedicating 30 minutes to hands-on labour.

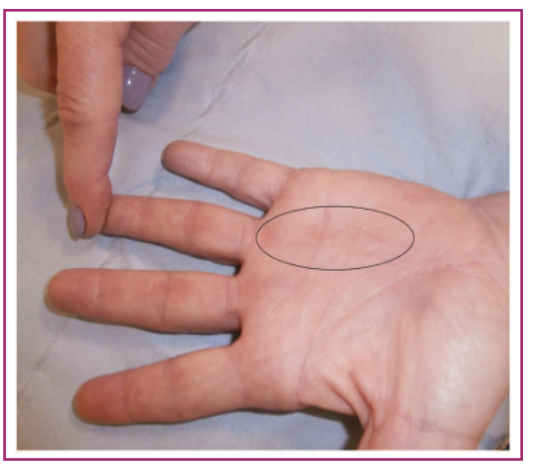

Figure 3: The ring finger's long flexor tendon has tendinopathy. To straighten the finger, it must be pressed backwards. Within the black oval, take note of the thicker tendon. Observe the scar from the removal of the carpal tunnel.

Figure 4: Dupuytren's Contracture.

These disorders have aberrant collagen deposition in the periarticular connective tissues as its aetiology, at least in part. Additionally, collagen's aberrant cross-linking and glycosylation's enhanced hydration may be significant. The issue is made worse by neuropathy and microangiopathy (Figure 5). Since they are not purely inflammatory in nature, these conditions have a tendency to get better on their own over time. Although the feet may also be affected, the upper limb joints are most commonly affected.

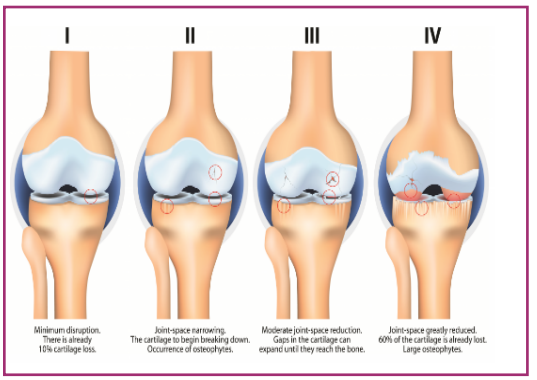

Figure 5: Pathogenesis of Limited Joint Mobility.

These conditions are caused by the abnormal cross-linking of collagen and the increased hydration of glycosylation may be important. Because of neuropathy and microangiopathy, the problem is exacerbated (Figure 5). These illnesses typically improve on their own over time since they are not solely inflammatory in origin. Although the feet may also be afflicted, the joints of the upper limbs are most frequently impacted. Even whilst those skin adjustments can show up even without decreased joint mobility, they're most apparent inside the small joints of the arms and are observed by thickness (Malakootian, 2022).

Complex Regional Pain Syndrome

Shoulder problems can coexist with reflex sympathetic dystrophy, often known as Sudek's atrophy or "shoulder hand syndrome." Although there is some indication that type 1 (reflex sympathetic dystrophy) is more frequent among diabetics, this link is not well established. As in previous cases, there is a complaint of discomfort, as well as warning symptoms of skin changes, hyperaesthesia, and vasomotor instability (Atroshi, 1999).

Diabetes patients with vascular, nephropathic, and neuropathic comorbidities had a decreased fracture risk. Higher urine calcium loss caused by hyperglycemia may result in decreased bone mineral density. The paradox of fewer fractures in T2D despite normal bone mineral density is attributable to increased cortical and trabecular bone porosity. In both women and men with T2D, the risk of hip fracture rose to 1.7 (ninety per cent confidence interval [CI]: 1.3-2.2), according to a meta-analysis of 12 studies. A summary RR of 1.2 (95% confidence interval: 1.01.5) demonstrated an increased risk for all clinical fractures. Even if worse glycemic control hasn't always been demonstrated to be a risk factor, there seems to be a clear link between having diabetes for a longer period of time and a higher fracture risk. An oral hypoglycemic medication called pioglitazone may make postmenopausal women more susceptible to fractures. Past generations did not suffer as we suffer today. Why is this? Probably the largest factor is that workers of the past performed a broad range of work activities that involved a

diversity of work postures and a wide range of movements. Today's 'static' work posture and highly specialized, repetitive work environment create a high occurrence! Although many researchers have postulated that CTS is primarily a result of repetitive movements, this is only part of the problem. If the shoulders are elevated by a fraction of an inch, muscles are supporting the weight of the shoulder and arm, rather than the joint and ligaments. If the shoulder is not elevated, even if the shoulders are not moving, the tension in the muscles forces the muscles to do (physiological) work. This invisible work fatigues the muscles creates muscle spasms, decreases circulation and may eventually shorten the muscle with fibrous tissue. Holding a piece of paper in front of you doesn't sound like much work, but don't forget about the weight of the arm. Think of your arms like a wrench or lever. Loosening a tight bolt requires Diabetic muscle infarction (aseptic myonecrosis, infarcted myonecrosis)

People with long-term, poorly controlled diabetes that has microvascular repercussions, most notably end-stage renal failure brought on by diabetic nephropathy, are more likely to develop the rare illness known as diabetic muscle infarction. Aside from acute muscle pain and swelling, which most frequently affect the thigh, there are also mild constitutional symptoms. Magnetic resonance imaging can be used to make diagnoses without needing a biopsy.

There may be a modest rise in creatine kinase in about 50% of patients. Surgery might only be necessary if compartment syndrome manifests, as it frequently improves with conservative treatment. Less work with a longer wrench. Similarly, there's a huge difference in the amount of work a person does when moving an object out at arm's length. If you pick up a heavy book with both hands and hold it close to your chest you can hold the position without much difficulty. Now hold a book out at full arm's length for a couple of minutes and your arms will shake with fatigue. The further we bend, the further we reach and the higher we reach, the more work we do. These concepts are referred to as ergonomic considerations. A person sitting at a computer should have their shoulders down and elbows close with greater than a 90 angle at the elbow. This means that if you are reaching up to the keyboard at all there's constant muscle spasm at the front of the shoulder.

Conclusions

Diabetes often has musculoskeletal consequences that, while not life-threatening, can cause substantial pain and impairment. They often affect people with long-term poorly managed diabetes as well as those with additional, more severe complications such as vascular, neuropathy, renal, and retinal issues. To minimise morbidity from these consequences, early detection of these issues and collaborative therapy between experts in rheumatology and diabetes are essential. No declared conflicts of interest exist.

References

Allam, A. H., Youssef, S. M., Moussa, H. H., & Ezzat, Y. (2020). Anti-citrullinated peptide antibodies with interstitial lung disease in patients with rheumatoid arthritis. *The Egyptian Journal of Chest Diseases and Tuberculosis, 69*(1), 171-177. https://doi.org/10.4103/ejcdt.ejcdt_102_19

Atroshi, I., Gummesson, C., Johnsson, R., Ornstein, E., Ranstam, J., & Rosén, I. (1999). Prevalence of carpal tunnel syndrome in a general population. *Jama, 282*(2), 153-158. https://doi.org/10.1001/jama.282.2.153

De Krom, M. C. T. F. M., Knipschild, P. G., Kester, A. D. M., Thijs, C. T., Boekkooi, P. F., & Spaans, F. (1992). Carpal tunnel syndrome: prevalence in the general population. *Journal of clinical epidemiology, 45*(4), 373-376. https://doi.org/10.1016/0895-4356(92)90038-O

Jääskeläinen, J., Ronkainen, S., & Takala, T. (2018). Kitaristin kramppi: Fokaalisen dystonian ja kitaristin rasitussairauksien osteopaattinen hoito. https://urn.fi/URN:NBN:fi:amk-201803263771

Luna, R., Manjunatha, R. T., Bollu, B., Jhaveri, S., Avanthika, C., Reddy, N., & Gandhi, F. (2021). A Comprehensive Review of Neuronal Changes in Diabetics. *Cureus, 13*(10), https://doi.org/10.7759/cureus.19142

Malakootian, M., Soveizi, M., Gholipour, A., & Oveisee, M. (2022). Pathophysiology, Diagnosis, Treatment, and Genetics of Carpal Tunnel Syndrome: A Review. Cellular and Molecular Neurobiology, 1-15. https://doi.org/10.1007/s10571-022-01297-2

Mori, K., Kasahara, T., Mimura, T., Nishizawa, K., Nakamura, A., & Imai, S. (2017). Prevalence of thoracic diffuse idiopathic skeletal hyperostosis (DISH) in Japanese: results of chest CT-based cross-sectional study. *Journal of Orthopaedic Science, 22*(1), 38-42. https://doi.org/10.1016/j.jos.2016.09.003

Rho, Y. H., Lu, N., Peloquin, C. E., Man, A., Zhu, Y., Zhang, Y., & Choi, H. K. (2016). Independent impact of gout on the risk of diabetes mellitus among women and men: a population-based, BMI-matched cohort study. *Annals of the rheumatic diseases, 75*(1), 91-95. https://doi.org/10.1136/annrheumdis-2014-205827

Rouxel, O., Beaudoin, L., Nel, I., Tard, C., Cagninacci, L., Kiaf, B., & Lehuen, A. (2017). Cytotoxic and regulatory roles of mucosal-associated invariant T cells in type 1 diabetes. *Nature immunology, 18*(12), 1321-1331. https://doi.org/10.1038/ni.3854

Tosti, R., & Ilyas, A. M. (2012). Acute carpal tunnel syndrome. *Orthopaedic Clinics, 43*(4), 459-465. https://doi.org/10.1016/j.ocl.2012.07.015

Waris, M., Arshad, N., Naz, A., Shabbir, M., Hanif, M., & Rehman, M. (2021). Carpal Tunnel Syndrome in Pregnant Women: A Cross-Sectional Study. *Pakistan Journal of Medical Research, 60*(4), 178-182. https://pjmr.org.pk/index.php/pjmr/article/view/183