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Disorders of the Hand

A Case Study Approach

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Using a case study approach, 2 disorders of the hands are presented. Dupuytren's contractures and bilateral trigger finger are described with a discussion of the interventions, including injection and surgical repair. Dupuytren's disease is a contracture of the connective tissue in the hand. It is also known as palmar fibromatosis and can occur bilaterally. This is a progressive disorder and causes deformity of the hands and eventually results in a decrease of functionality. Trigger finger is a common finger ailment that also causes deformity of the hand. This disorder is often referred to as stenosing tenosynovitis and can occur in several fingers bilaterally. The inflammation and hypertrophy of the sheath restricts the motion of the flexor tendon that results in triggering of the affected finger. It is painful and disabling. The etiology, prevalence, incidence, diagnosis, treatment, and nursing care of these disorders are discussed.

"Man alone has a hand" (Alpenfels, 1955). Hands represent a vital part of our anatomy. We use them for expression, to offer comfort, perform basic tasks of daily living, conduct professional activities, communicate, and be creative. They are used as tools and weapons and can be seen as representative of the meaning of a whole person. Hands allow us to perform intricate tasks or heavy labor. Hands are a sensory organ used to feel heat or cold or rough surfaces or smooth or to communicate our feelings with a touch. Many individuals use hands when talking to emphasize or enhance speech, and hands are literally used to communicate when a person uses sign language. Hands are used to gesture a greeting or a sign of farewell.

Hands need to be flexible and pain free to function at maximum capacity. They can offer much information about an individual's ability to be functional ranging from the simple activities of daily living to performing intricate activities such as surgery. An inability to have full function of hands can alter a life in profound ways. Consider a retired, 80-year-old woman who can no longer crochet or embroider and struggles to button her clothing. The inability of a plastic surgeon to hold a scalpel or a needle holder can have a far-reaching effect. Even when hands remain flexible, the pain associated with neuropathies and other disorders can preclude using hands in a meaningful way.

Anatomy of the Hand

The hand is an intricate mechanism and consists of multiple bones, ligaments, and tendons (see Figure 1). Twenty-seven bones make up the basic skeleton of the wrist and hand. It is innervated by three nerves: the median, ulnar, and radial nerves. There are 14 phalanges in the fingers of the hand; the five metacarpal bones are found in the middle of the hand and the eight carpal bones create the wrist. The first metacarpal bone (thumb) is the shortest and most mobile (Wilhelmi et al., 2011).

There are numerous muscles, ligaments, and sheaths in the hand. The muscles contract and allow the hand to move the bones, while the fibrous ligaments bind the joints and the sheaths are tubes that surround parts of the finger. Tendons flex the interphalangeal joint, while digit extension occurs from the extensor tendons.

The pulley system is essential for flexion of the finger. The thumb has two annular pulleys and one oblique pulley, while in the fingers the second and fourth annular pulleys are critical. Disorders of the pulley system can result in less-active flexion of the digit for some tendon excursion.

Considering the complexity of the muscle, bones, ligaments, and tendons in the hand, it becomes obvious why even a minor problem can cause disability or a decrease in functionality. The most common dysfunctions of the hand include osteoarthritis and rheumatoid arthritis. These disorders result in mild to severe pain and some limitations in function to major deformities and an inability to use the hands at all. Diagnosis and treatment of these two disorders are a specialty in itself. However, even less-common disorders can lead to permanent disability if not diagnosed and treated appropriately. The following case scenarios are examples of these disorders.

Dupuytren's contractures: Case Study 1

Joseph is a 48-year-old electrical lineman in good health with no chronic health problems. He presented

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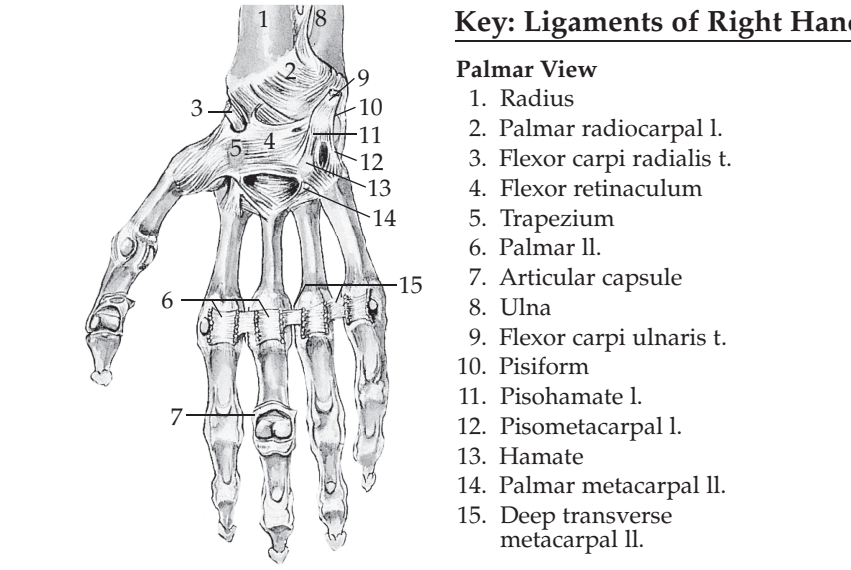

FIGURE 1. Ligaments of the right hand. From Anatomical Chart Company/Lippincott Williams & Wilkins.

to his primary care provider with a complaint that some fingers on both hands were starting to bend and he couldn't straighten them. He was concerned that he had arthritis. He stated his mother had severe arthritis in both hands and knees with major joint deformities. He was referred to an orthopedic surgeon who also specialized in hand surgery. The surgeon quickly diagnosed Dupuytren's disease and recommended surgical repair. On examination, it was determined that Joseph had progression in the small (fifth finger) of both hands and the beginning of contractures in both ring fingers. Bilateral regional fasciotomies were performed with mixed results. Both ring fingers were repaired successfully and regained full flexibility. Both small fingers were not successfully repaired and remained flexed at a 90-degree angle in his right, dominant hand and 45-degree angle in his left hand. Follow-up revealed that Joseph was able to return to work after an uneventful 3-month postoperative period. The disease did not progress over time after the surgery.

Dupuytren's disease or contractures are also known as palmar fibromatosis. The connective tissue under the skin of the palm contracts while collagen cords form, thicken, and finally shorten. This can cause permanent flexion contractures of the finger joints and progressive flexion of one or more fingers (Figure 2).

This disease usually occurs in one hand first and may or may not appear in the other hand at a later time. An epidemiological study conducted of 23,104 individuals revealed that 61% of the 165 individuals with a diagnosis of Dupuytren's disease sought care when a bump developed on the palm or at the base of the fingers. A much lower percentage (30%) indicated that a rope-like growth was the first symptom they noticed followed by finger flexion or dimpling, 82% indicated that the first symptom occurred in only one hand, 18% of the patients reported that a family member had one or more of the same symptoms, and only 3% stated that the family member had been diagnosed with Dupuytren's disease (Dibenedetti, Nguyen, Zogrqafox, Ziemiecki, & Zhou, 2011).

Dupuytren's disease is a progressive genetic disorder that occurs as a result of pathologic collagen production and deposition. The resulting contractures most commonly affect the metacarpophalangeal joint, the proximal interphalangeal joint, or both. The most commonly affected are the ring and little fingers. It occurs in all racial and ethnic groups but the incidence is highest in those of European descent. It is more common in men than in women and the incidence increases with age. It has been associated with smoking, alcoholism, diabetes, epilepsy, and HIV infection (Hurst et al., 2009).

Bowere, Nelson, and Gazzard (1990) conducted a comparison study of 50 males with HIV stage IV and stage III and a control group of males who were negative for HIV antibody. Eighteen of the HIV patients had bilateral Dupuytren's contractures. None of the control subjects had Dupuytren's contractures. The prevalence of Dupuytren's contracture in the general population is 4% to 5%–6%. The prevalence in this study was 36%. A more recent review of the literature indicates that there has been no further evidence reported of a link between HIV+, liver disease, tuberculosis, syphilis, and high serum lipids (Mafi, Hindocha, & Khan, 2012).

Regional palmar fasciectomy is the most commonly performed surgical procedure for this disorder. Only the diseased parts of the superficial fascial aponeurosis are excised. Good results have been reported with this procedure. Bulstrode, Jemec, and Smith. (2005) reported that regional fasciectomy, also called a modified Skoog's procedure, does correct the deformity but does not prevent recurrence of the disease. Recurrence occurred in 23 of 75 patients after a 9-year follow-up.

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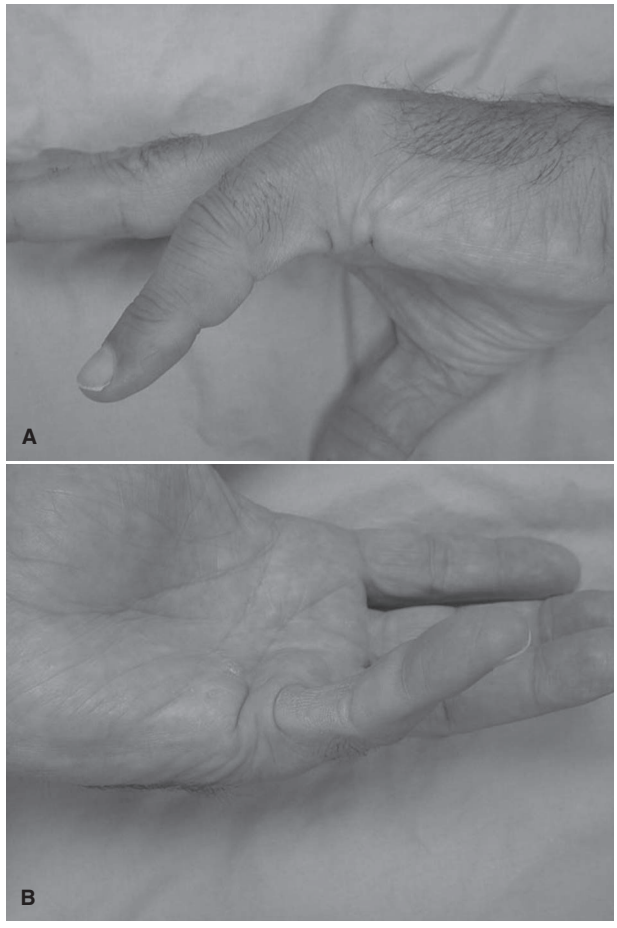

FIGURE 2. (A and B) Preoperative clinical photographs demonstrating a Dupuytren's contracture.

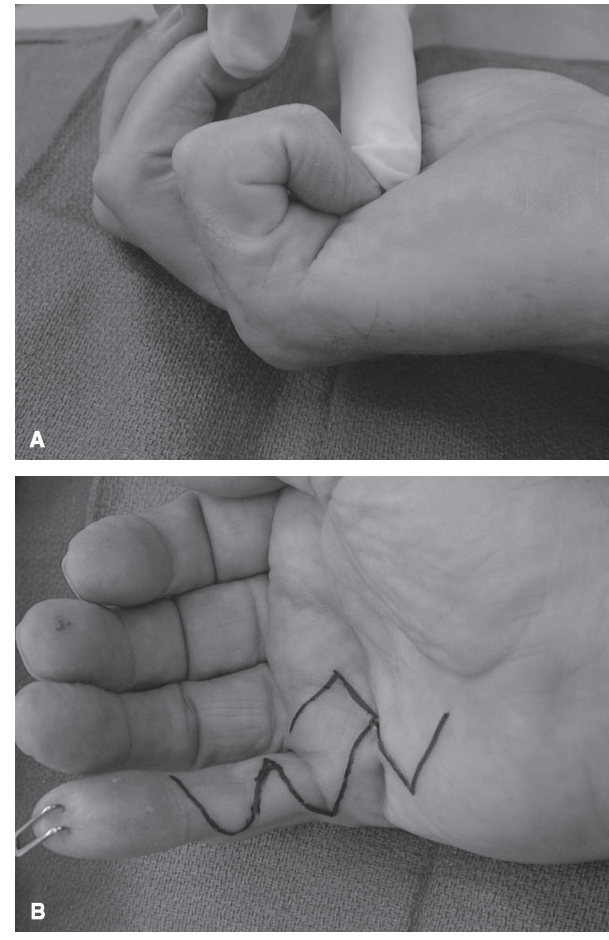

FIGURE 3. (A) Intraoperative photograph of the finger prior to surgery. (B) Preoperative demonstration of the surgical incision for Dupuytren's contracture.

Closed fasciotomy is a surgical technique that is successful when the metacarpal (MCP) is contracted but is not as useful for proximal interphalangeal joint (PIP) contractures. This technique also involves some risk of neurovascular injury. This procedure is performed under local anesthesia in an outpatient setting. Crean, Gerber, Graverand, Boyd, and Cappelleri, (2011) reported that this procedure is useful for patients who may not be candidates for local fasciectomy. In a 10-year follow-up of 160 patients treated with closed fasciectomy, 34% of patients required no further surgery while 66% of the patients required additional surgery in an average of 5 years.

A radical fasciectomy with a complete removal of the palmar aponeurosis and natatory ligaments was thought to be a cure for Dupuytren's disease (McIndoe & Beare, 1958) (see Figures 3a and 3b). Satisfactory results were obtained in more than 200 cases; however, recurrent disease was not eliminated by the more extensive surgery. Hueston (1961) found an equal recurrence rate at 5- to 15-year follow-up in a comparison study of limited fasciectomy (regional) and this more radical procedure. More recently, Crean et al. (2011) report that 61%–97% of patients achieved a mean improvement in contracture angle from 58% to 79%. About 20% of the patients experienced an adverse event with a 39% recurrence rate.

Percutaneous needle fasciotomy is an outpatient procedure that can be done in the office under local anesthesia. It involves making multiple puncture sites and sectioning the Dupuytren cord. In a study of 211 older patients (mean of 65 years old) although there was only one digital nerve injury, no infections, and no tendon injuries, the recurrence (58%) and disease progression (69%) were high at a 3-year follow-up (Foucher, Medine, & Navarro, 2003).

Distraction and passive extension techniques have been successfully utilized in conjunction with fasciectomies that offer gradual passive extension. A device called the Proximal Interphalangeal Skeletal Traction Extendor was introduced by Hodgkinson (1994) for outpatient preoperative use and may facilitate successful surgery. A staged extension device technique was utilized with 38 fingers in 27 patients with Dupuytren's contractures. Sixty-nine percent of the results were reported as good to excellent (White et al., 2012).

Finally, if complete extension is not obtained by careful digital fasciectomy, the PIP joint may need to be released. Alternative procedures also include arthroplasty that includes implants and arthrodesis; however, these procedures increase a functional angle at the joint but limit finger function.

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The injection of collagenase (Xiapex) into the cords has been approved for use. This enzyme can break down the cords that are pulling the fingers into flexion. This is an outpatient procedure that does not require anesthesia but does require frequent follow-up to have the fingers manipulated by the surgeon (Badalmente & Hurst, 2007).

A three-step approach to the management of Dupuytren's contracture has been proposed (Denkler, 2012). Needle fasciotomy has been suggested as a first step with reports of long-standing excellent results. Xiaflex injections are a possible second approach with positive results reported after one treatment. Finally, fasciectomy has been recommended with recurrent disease; however, there are reports of high complication rates associated with this procedure.

Physical therapy may be helpful in the early stages of the disease by applying heat and ultrasonographic waves. The patient may also be advised to wear a splint or brace to stretch the fingers and perform range-of-motion exercises daily. Following surgical correction, physical and occupational therapy may be recommended. Patients who have not achieved full extension of the affected fingers may need to learn adaptive techniques and use assistive devices to enhance function (Balaguer, David, Ihrai, Daideri, & Lebreton, 2009).

Postoperative care requires careful attention to maintaining extension with flexion of the MCP and extension of the PIP. This is achieved with the use of a dorsal splint to avoid pressure on the incision. Splinting may be maintained for at least 6 weeks and some require 3 months of immobility to minimize scar contractures. Rehabilitation is a progressive process of increasing activity and decreasing splinting. Return to normal activity is usually in 2–3 months.

The risks and side effects of surgical and other treatment for Dupuytren's disease include joint stiffness and loss of preoperative flexion, hematoma, skin loss, infection, nerve injury, vascular injury, prolonged edema, and reflex sympathetic dystrophy. Significant hand arthritis is a contraindication to surgery because of the high risk of worsened hand function after surgery (Denkler, 2010; Skoff, 2004). With successful surgery, patients may be able to carry objects, play tennis, or even type on keyboards, but fine motor activity may be even more difficult than before the surgery. Activities such as handwriting, crafting, playing music, or holding items securely may be difficult or impossible.

Nursing implications for patients pre- and postoperatively need to focus on patient education and helping the patient understand the disease, its progression, and the realistic outcomes that can be expected from intervention. Patients must be encouraged to perform physical and occupational therapy exercises on a regular basis.

Hand infections can cause severe problems and must be identified and treated very aggressively. Patients should understand the need to maintain the dressings postoperatively, avoid getting the area wet, and report any signs of infection such as increased pain at the operative site immediately. The potential for a decreased ability to hold items securely is a safety concern and patients should be reminded that this can cause accidents such as dropping a hot pot of boiling water.

Dupuytren's disease cannot be cured; however, there are many interventions that can decrease the loss of functionality of the hand and can halt or delay the progression of the disease.

Palmar Tenosynovitis (Trigger Finger): Case 2

Susan K. is a 64-year-old working registered nurse. She has presented for her fourth surgical procedure for stenosing tenosynovitis (trigger finger) in the past 10 years. Susan has a 9-year history of Type 2 diabetes. Her blood sugar has been maintained at a Hgb A1C of 6.0–6.3 for many years on a daily dose of metformin 500 mg twice a day. She has no other comorbidities. She continues to practice patient care while working as the nurse manager of a busy emergency department. The management job involves frequent computer use. Susan states that the ring finger on her left hand has become stiff and she can hear and feel a popping sensation when she moves that finger. The finger will often catch in a bent position and she can no longer actively extend it but must passively straighten the finger. Susan states that she has decreased direct patient care recently as the trigger finger has gotten worse and she is concerned she will drop anything held in the left hand if the finger becomes locked. She also reports that the pain is severe (8 on a 0–10 scale) when the finger locks and she attempts to straighten it. Susan has had surgical release of the middle finger of her left hand, the middle finger of her right hand, and the thumb on her right hand. When the condition was first presented, she had a local corticosteroid injection of the left middle finger and later for the middle finger of her right hand. In both cases, the condition returned after approximately 6 months and seemed to be worsened. The surgeries performed to release the tendon sheath in all of the affected fingers have been successful and she states she has been pain free and has full function of both hands with the exception of the ring finger of the left hand. The condition began with finger stiffness and the popping sensation and has rapidly progressed to frequent locking. Surgical release was performed under local anesthesia and light sedation in an outpatient surgical setting. At a 6-month follow-up, Susan reported a successful outcome with no adverse side effects and has regained full flexion and extension of the affected finger.

Trigger finger or stenosing tenosynovitis is an inflammation of the flexor tendon A1 pulley, which becomes irritated as it slides through the tendon sheath tunnel. If untreated, the tendon may thicken and nodules may form that increase the difficulty of moving the tendon through the tunnel. The tunnel itself may thicken, which further increases the problem. The most commonly affected is the ring finger followed by the thumb, long, index, and small fingers. The cause is unknown; however, it is six times more common in women than in men and individuals who are between the ages of 40 and 60 years. There is also some evidence that there is a relationship with diabetes and rheumatoid arthritis. In diabetes, the incidence seems to be related to the duration of the disease and not glycemic control. There is also evidence that there is a correlation with carpal tunnel syndrome, de Quervain's disease, hypothyroidism, renal disease, and amyloidosis. Although there have been

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suggestions that trigger finger is associated with occupations that require gripping and hand flexion, this relationship has not been supported with evidence and the relationship is questionable. The evidence suggests that the causes of trigger finger are multifactorial and very individualized (Makkouk, Oetgen, Swigart, & Dodds, 2008).

The diagnosis of trigger finger does not require imaging. The patient's report of popping and locking of the finger is usually all that is needed for a diagnosis. Prior to surgical intervention, the finger is flexed or "triggered" to confirm the diagnosis (see Figure 3).

Treatment for trigger finger can begin with activity modification accompanied by nonsteroidal anti-inflammatory drugs for pain control. Splinting is done to prevent the friction caused by flexor tendon movement through the tendon sheath tunnel (Akhtar, Bradley, Quinton, & Burke, 2005). Splinting has been used as a conservative treatment option. The splint is used to maintain the MCP joint at 10°–15° of flexion for about 6 weeks. This appears to be effective for mild triggering (Ryzewicz & Wolf, 2006). Splinting has not been successful in patients with severe disease or long-term duration of symptoms.

The injection of corticosteroids is recommended before surgical intervention. It has been found to be 93% effective especially in nondiabetic patients (Green et al., 2005). It has been less successful in patients with a long history of the disease, diabetes mellitus, and multiple digit involvement. If the condition does not resolve after the first injection, or if symptoms recur, a second injection is one-half as likely to succeed (Benan, Nakhdjevani, Loyd, & Schreuder, 2012). Patients report that the injection is extremely painful and are reluctant to allow a second injection or an initial injection if the condition occurs in another digit.

Surgical treatment is very successful and is regarded as the gold standard of treatment for complete resolution of trigger finger. Operative intervention can be percutaneous or an open release. Surgical intervention is generally offered after failure of conservative treatment that includes splinting and corticosteroid injections (Benson & Ptaszek, 1997).

Percutaneous trigger release is done as an office procedure with the use of lidocaine as a local anesthesia. Success rates have been more than 90% with this procedure (Ryzewicz & Wolf, 2006). However, there is a risk of digital nerve or artery injury.

Open release of trigger finger has been the treatment for more than 100 years. The procedure involves full sectioning of the A1 pulley with a greater exposure that is thought to be safer. Surgery is done through a small incision in the palm of the hand at the base of the affected finger (see Figure 3b). Complications may include reflex sympathetic dystrophy, infection, stiffness, nerve transection, incision pain, flexion deformity, flexor tendon bowstringing, and recurrence (Akhtar et al., 2005). Most patients are able to move the finger immediately. There is usually minimal pain and swelling and complete recovery can be expected in 2–3 weeks. If the condition was severe before the surgery and the affected finger was very stiff, recovery might take up to 6 months and required some physical therapy and finger exercises.

A compression dressing is applied after surgery to protect the incision. Nonabsorbable sutures are used to close the site that should be removed about 14 days after the surgery. Patients are instructed to apply ice to the palmar surface of the hand and keep the affected hand elevated for several days. The dressings can be removed in 3–5 days, and the patient can be instructed that they may shower but to apply a light covering such as a band aid until the sutures are removed. If a splint has been applied during surgery, patients are instructed to continue to use the splint until the follow-up visit. Patients are offered analgesia that ranges from oxycodone to nonsteroidal anti-inflammatory drugs or Tordol (ketorolac). Most patients, however, report a very low level of pain or discomfort and seldom report pain greater than 4 on a scale ranging from 0 to 10.

There is a very low incidence of infection (1:1000) following this surgery; however, patients should be instructed to report any symptoms such as an increase in pain, swelling, warmth, and/or redness of the hand, wrist or forearm, fever, chills, or night sweats (Denkler, 2010).

Implications for Nursing

With careful attention to postoperative care for any hand surgery, infections can be avoided. However, hand infections can be very serious and cause problems that persist even after the infection has been cleared. Most infections, if diagnosed early, can be treated with antibiotics, rest, elevation, and other noninvasive methods. In some cases, even after only 1–2 days, the infection can evolve quickly and require a combination of antibiotics, surgical drainage, and debridement of infected or dead tissues. Treatment may require the intravenous use of antibiotics and hospitalization. Deep tissue infections may spread to the wrist and forearm (Denkler, 2012). A relatively minor, usually very successful surgical procedure can progress into a serious problem that requires hospitalization to resolve and may permanently alter the outcomes from the original surgery.

Patients may have a tendency to discount the seriousness of this surgical procedure and return to all activities because the finger is fully mobile and the pain from the condition is gone.

Nursing intervention should be focused on careful patient education with feedback to determine whether the patient understands the significance of attention to self-care and the need to follow up for suture removal and assessment of the surgical site. An emphasis should be placed on the need to call immediately if symptoms occur or worsen.

In conclusion, conditions that affect the functionality of the hand should be diagnosed and treated. The tendency to minimize disorders of the hands can lead to progression of the disease and have a major impact on activities of daily living. In some cases, a curable or fixable problem becomes a major disability.

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