

De Quervain's Disease: Stenosing Tenovaginitis at the Radial Styloid Process

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DE QUERVAIN'S disease is an eponymic designation given to a painful condition in which there is constriction of the tendon sheath of the thumb, interfering with the free gliding of the conjoined abductor and extensor tendons when they are pulled through the stricture at the radial styloid region. Descriptions of this disease are to be found mainly in the surgical literature. Its existence is well known to the orthopedic surgeon but may not be as well known to the general surgeon, and even less so to the internist. Cases have been diagnosed erroneously as arthritis, periostitis, chronic sprain, neuralgia, or causalgia, and some have been referred for psychiatric treatment. This report is based on findings in 12 cases, including two cases of bilateral de Quervain's disease, seen over the past six years. The disorder was disabling to a varying degree and the usual predominant concern of these patients was a fear of crippling arthritis.

DESCRIPTION

De Quervain's disease is a term used to describe stenosing tenovaginitis as it occurs in the first dorsal compartment of the wrist in which the tendons of the abductor pollicis longus and extensor pollicis brevis pass to their insertion in the thumb. It should be noted, however, that stenosing tenosynovitis does occur in two other locations in the hand, commonly in the sheath of the flexor pollicis longus and in the flexors of the lesser fingers, especially in the third and fourth fingers. The relative incidence of this condition is as follows: 39% occur in the radial styloid region, 31.9% occur in the tendon of the flexor pollicis longus and 26.1% occur in the lesser fingers. In children, stenosing tenovaginitis has been described in the flexor sheath of the thumb and is manifested by inability to extend the distal phalanx of the thumb. This condition is referred to as flexor fixation or "trigger thumb" and is readily corrected surgically. Stenosing tenosynovitis is due to the constriction of the tendons by their retaining fibrous ligament and sheaths; this establishes irritation and inflammation and interferes with the free gliding movement of the tendons. The condition is usually painful and disabling. In some locations a painful snapping may occur as the swollen tendon enters the stenotic fibro-osseous space. If the discrepancy between the tendon and the space increases, the tendon may become painfully locked into place. This locking and snapping rarely occurs in de Quervain's disease but may occur frequently in the other two locations.

ABSTRACT

Twelve cases of stenosing tenovaginitis at the radial styloid process (de Quervain's disease), including two bilateral cases, are reviewed. These patients presented the typical symptoms of pain just proximal to the radial styloid process accompanied by limitation of abduction of the thumb. Many previous reports have emphasized the frequency of aberrant tendons in this region and have implied that such anomalies may play a part in the etiology of this disorder. In our cases aberrant tendons were not found. Pronounced thickening of the tendon sheaths was present at operation and accumulations of fluid resembling ganglion formation were frequently noticed. All forms of therapy except surgical excision of the involved tendon sheaths were largely ineffective. This surgical procedure was so simple and satisfactory that it is recommended as the treatment of choice. The diagnosis of de Quervain's disease is easily missed unless the examining physician constantly keeps it in mind.

ANATOMY

Tendon sheaths of synovia form when a tendon is subjected to pressure or friction on two surfaces. The function of the sheath is to protect the tendon with a coating of synovial fluid; these sheaths are essentially tubular bursae. The synovial sheaths of the tendons of the abductor pollicis longus and the extensor pollicis brevis are usually located together in the first dorsal radial compartment of the wrist. This compartment, approximately 3 or 4 cm. long, is formed by the long bony groove in the radial styloid process and a tough overlying annular ligament which acts as a retinaculum or pulley. This retinaculum is approximately 1 mm. or less in thickness and 2 to 3 cm. wide, in a proximodistal direction. The tendons form the volar or anterior boundary of the anatomical snuff box. These tendons are markedly angulated when the hand is deviated radialward or acutely dorsiflexed. It has been noted that the angulation is greater in females than in males; this may account for the increased incidence of this disease in women. In the past decade many studies have been made regarding the occurrence of aberrant tendons in this region, and what is described above as the usual anatomical arrangement of these tendons has been found to be the exception,

owing to the frequent presence of aberrant tendons.

Lapidus observed that in the majority of 58 cadaver wrists examined (86%) three or more tendons were found in the sheath. Bunnell reported aberrant or third tendons in 12 of 22 of his cases of de Quervain's disease, and Lacey noted aberrant tendons in three-quarters of the wrists examined in both surgical and cadaver material. Giles noted that there were many variations involving reduplication of the abductor pollicis longus and more rarely of the extensor pollicis brevis tendon which may occasionally lie in a separate osseofibrous canal. As many as five separate tendons of the abductor pollicis longus have been reported. It is not unusual to find the abductor pollicis longus and the extensor pollicis brevis tendon lying in a separate compartment in the same canal; also, the extensor pollicis brevis tendon may lie in its own separate fibrous canal in the depth and the more distal part of the common compartment. Such variations of tendon distribution may account for an occasional failure of surgical therapy in cases of de Quervain's disease. Decompression of the main fibro-osseous canal may not relieve the symptoms of the disease if an accessory tendon remains unrecognized and is left compressed in its own canal.

ETIOLOGY

An increased incidence of this disorder has been noted in recent years, and although this may be due to more frequent recognition of de Quervain's disease, it may also be attributed to the type of repetitive occupational trauma performed today, involving continued strain in the use of the hand. It seems that repeated irritation of the sheath and the tendons by forceful back-and-forth motions of the tendons during repeatedly performed operations, particularly dorsiflexion of the wrist and abduction of the thumb, are prone to produce this disease state. As the fibrous sheath becomes more edematous, it encroaches upon its tendons, with further aggravation of the condition. Friction may be increased as the smooth osseous space of the canal is changed by trauma. The role of occupational irritation as an etiological factor is further borne out by the fact that many cases occur when there is a change in occupation or resumption of a former job after a lay-off. This type of indirect trauma seems to be involved in the etiology to a greater degree than does direct trauma. However, the superficial position of the tendons makes them more easily susceptible to external and direct trauma. The disease is noted to be more common in persons who do manual work, particularly those who pinch the thumb while moving the wrist, e.g. housewives, knitters, typists, nurses, switchboard operators, pianists, golfers and flycasters. It is approximately 10 times more common in females than in males, possibly because of the greater excursion of the right first carpometacarpal joint in females, and it more often involves the right than

the left hand, probably owing to the predominance of right-handed people. The age occurrence is anywhere from 25 to 60 years, averaging 46 years. It is frequently unilateral, but occasionally bilateral cases are seen.

The role of aberrant tendons in the etiology of this condition is still speculative. Some authors argue that because aberrant tendons occupy more space in the compartment, the factor of frictional trauma is increased. This is refuted by the fact that in cadaver material the incidence of aberrant tendons is approximately the same as in surgical material in persons with typical symptoms. Leo noted that in 28% of his cases, trauma to the wrist was reported; however, in only two cases was there direct trauma and in seven cases indirect trauma. In our series of patients there were only two who reported any direct trauma in the region involved. In discussing the etiology Leo noted the relationship to trauma and friction and suggested that this might be a "collagen disorder", as it is often associated with rheumatoid disease.

SIGNS AND SYMPTOMS

In the majority of cases the onset is gradual but it may begin acutely following a blow or sudden strain, gripping or lifting, or after a hard day's work involving the use of the wrist and hand. Typically in de Quervain's disease there is a dorsal radial pain at the wrist which may radiate up the radial side of the forearm or down into the thumb. Pinch-grasp is weak and insecure. Difficulty in picking up and holding objects is noted and occasionally objects are dropped. Pain and disability may be so great that patients are unable to continue with their occupation or may refuse to use the affected hand for any purpose. There may be interference with sleep because of pain and discomfort. On examination, tenderness on pressure over the radial styloid process is noted; usually a palpable mass can be felt that moves with flexion and extension of the thumb. There may be a few degrees restriction of full abduction, and this may be tested by placing the hands in the praying position and abducting the thumbs simultaneously. The difference in the degree of abduction can then be readily noted. Pain is typically experienced with forced abduction of the thumb. Finkelstein's test is considered to be positive if a stabbing, intense pain is elicited by forced ulnar deviation of the wrist after the patient has folded his thumb into the palm of the hand and flexed his fingers tightly over it. Usually there is no snapping or locking when the tenosynovitis occurs in this location.

Radiographic examination of the affected area is of no positive diagnostic value but may be helpful in ruling out other conditions.

DIFFERENTIAL DIAGNOSIS

The differential diagnosis includes acute tenosynovitis, tuberculous tenosynovitis, gout, gonor-

rheal arthritis, monarticular rheumatoid arthritis, osteoarthritis, tumour or local lesions of the peripheral nerves, and psychoneurosis. De Quervain's disease is not rare and should be considered and included in the differential diagnosis of those conditions which cause pain and disability in the wrist, thumb or hand. When the examiner is familiar with this disorder and keeps it in mind, the diagnosis usually presents no problem and there is little tendency to confuse this disease with other conditions.

PATHOLOGY

De Quervain's disease is thought to be primarily a degenerative process, secondary to trauma with proliferation and vascularity of the tendon sheath.

In the gross, the sheath or sheaths of the abductor pollicis longus and the extensor pollicis brevis tendons appear greatly thickened and have undergone a fibrocartilaginous change. Normally the sheath is about $\frac{3}{4}$ mm. thick but in this condition it may be 2 or 3 mm. thick, and in a number of our cases we have noticed localized encysted increases in synovial fluid, suggesting a small ganglion formation. This thickening is usually limited to a length of 1 to $1\frac{1}{4}$ inches in a proximal-distal direction, representing the retinacular portion of the fibro-osseous canal of the tendon sheath.

The tendons themselves have been described as lacking their normal lustre and occasionally showing inflammation and edema in the epitendon. The tendons may show constriction in the region of the thickened sheath and bulbous enlargement above and below this area. This condition of the tendons is rare, however, in de Quervain's disease and is much commoner in the other forms of tenosynovitis encountered in the hand. In our cases the tendons appeared essentially unchanged in appearance when they were eventually exposed.

Microscopically, there is a great thickening of the fibrous wall of the osseofibrous canal, this being due to increased cellularity as a result of fibroblastic proliferation and also to a marked increase in vascularity with the formation of many new blood vessels. In the deeper portions of the sheath the areas of degeneration previously mentioned have become converted to fibrocartilage. The synovium may be eroded in places and in other areas may show proliferation, with an increase in the synovial lining cells and occasionally infiltration with a few round cells, but leukocytic infiltration has not been described. True adhesions between the tendon and the sheath are not found.

The amount of thickening encountered, it has been suggested, varies directly with the duration and severity of the symptoms, and where the sheath appears inflamed in the gross, it is found to be extremely sensitive. When the marked thickening of the sheath and consequent trapping of the tendons is visualized at operation, it is not hard to

understand why conservative measures so frequently fail to relieve this condition.

TREATMENT

We have tried three types of treatment, two conservative and one surgical. These were: (1) immobilization of the affected wrist in a plaster cast; (2) injection with hydrocortisone; and (3) unroofing the tendons by excision of the thickened tendon sheath. Six cases in our series were initially treated by plaster immobilization. This was usually attempted only in cases of less than four to six weeks' duration. Two of these patients secured relief while the cast was on, but symptoms promptly recurred when immobilization was discarded. Three received no help from this procedure, and one patient who has had intermittent splinting has so far had continuing relief. We likewise found that injectable hydrocortisone failed to produce much palliation. With one exception all of our patients were eventually treated surgically and this form of treatment is so simple and almost universally gratifying that we feel that conservative measures have little place in therapy of this disease. Even in poor-risk patients local anesthesia can be used satisfactorily, although if there is no contraindication, general anesthesia is preferable. When general anesthesia is used, a pneumatic tourniquet is placed about the arm and a transverse incision about 2 cm. long is made over the nodule that can usually be palpated in this area. If no nodule is present, the incision is made about 1.5 cm. proximal to the distal tip of the radial styloid process. Although a longitudinal incision might be thought to give a better exposure, a transverse incision with good retraction is quite adequate and gives a much more satisfactory cosmetic effect.

Superficial branches of the radial nerve passing to the thumb are avoided and retracted. Patients frequently complain of numbness on the dorsum of the thumb postoperatively, but this is not a problem if they are reassured that normal sensation will gradually return. Subcutaneous fat is cleared out and the thickened sheath is then exposed. It is probably a good plan to pass to the proximal end of the sheath and split the thickened portion thoroughly throughout its full length of $1\frac{1}{4}$ to $1\frac{1}{2}$ inches by passing down the plane between tendons and sheath. Some authors recommend doing no more than this, but we have preferred to excise the abnormal sheath as thoroughly as possible, moving wrist and thumb to be sure the tendons are gliding freely without any interference. At this point a search should be made for any aberrant tendons and tendon sheaths; if these are found, the constricting sheaths should likewise be excised. Some authors favour removal of the aberrant tendons but this is not necessary. No attempt is made to approximate fat or any other deeper tissues, the skin alone being closed with interrupted sutures. No postoperative bow-stringing of tendons has been described or encountered in our cases.

RESULTS

These patients, during a recent postoperative assessment, were almost unanimous in their satisfaction with the surgical result, and several commented that they did not know why they had not had this operation done much sooner. With one exception, all 12 wrists were reported as free of pain, stiffness or disability. When questioned further regarding their results, one patient felt that perhaps her hands were not quite as strong as before (bilateral case). Another has some residual slight numbness in the thumb. Despite these considerations, both these patients are very happy with their results. One exception was an 81-year-old woman who stated that the affected wrist still ached a great deal some days, but she did admit that she could use the wrist much better than before and could now knit for half an hour at a time, whereas previously this pastime was impossible. The possibility exists that an aberrant tendon may have been overlooked in this case. These results were observed after follow-up periods of from six months to five years after operation.

CASE REPORTS

CASE 1.—A 49-year-old right-handed factory inspector was seen on November 29, 1955. As an inspector she was required to work rapidly with her hands, inspecting and gauging small objects. She had been receiving chiropractic treatments for "arthritis of her hand, arm and back" with only partial relief. She consulted her physician, who referred her for treatment of arthritis. In addition to her complaint of pain in the arm she was also found to have hypertension, menopausal symptoms and evidence of osteoarthritis, including Heberden's nodes. She described pain in her right wrist on grasping or picking up objects, of six months' duration. She did not drop objects. She described her hand as going to sleep at night. Previous treatment had included splinting, heat and aspirin. There was no family history of rheumatic diseases.

Examination revealed tenderness over the right radial styloid process with pain on abduction of the thumb and a positive Finkelstein's sign. On the lateral side of the right wrist about $\frac{3}{4}$ in. proximal to the styloid process was an oval swelling that measured about 1 cm. in diameter and was readily seen when the two wrists were compared. It was firm, almost cartilaginous in consistency, and very tender. There was 10-15° limitation of full abduction of the thumb. Movement of the tendons in this area was otherwise unrestricted and there was no snapping. The wrist was explored and the tendon sheaths excised, with satisfactory relief of symptoms.

In February 1959, she fell, sustaining an injury to her left wrist. Initial radiographs were reported negative. As her distress continued, repeat radiographs showed a crack fracture of the distal radius. Immobilization for five weeks was accompanied by relief of pain. However, as soon as the cast was removed the wrist was more painful than before the application of the cast and she was quite unable to use her hand. Examination revealed typical evidence of de Quervain's disease with tenderness on pressure over the radial styloid process and a positive Finkelstein's sign. In May

1959 her left wrist was explored and she immediately obtained relief with surgical release of the tendons in this wrist.

Since that time her wrists occasionally ache with changes in the weather but she has no difficulty with use of the wrist and has continued at her former occupation.

CASE 2.—A 57-year-old Jewish, right-handed, widowed housewife with a past history of cholecystectomy, gallstones, appendectomy, coronary heart disease with myocardial infarction, and diabetes mellitus of 11 years' duration, was seen on July 4, 1956. She gave a story of disabling pain in the right wrist of two years' duration. This had been treated by x-ray therapy, injection, and application of a cast. Although the distress did not leave her, it did seem to vary in severity over the period of two years but was much worse following her coronary thrombosis. She described her wrist as being stiff and she was unable to use the affected hand for any purpose because of the pain. She was unable to lift a cup or to give herself her own insulin, and required the services of a visiting nurse each day. She denied any history of trauma; there was no family history of "rheumatism", although she described herself as being "full of rheumatism". On examination she had tenderness and slight swelling over the radial styloid process. Any attempt to perform Finkelstein's maneuver was impossible because of pain. She also noted pain on pinching of the thumb.

At operation the tendon sheath was thickened to approximately 1 cm., and this area of increased thickness and stenosis extended over a length of about 2.5 cm. On division of this stricture a small amount of clear synovial fluid escaped. The entire thickened portion of the sheath was removed by sharp resection, leaving the two tendons involved completely free so that they had a smooth gliding action. Microscopic examination showed no specific inflammatory reaction but did show mucinous degeneration of fibrous tissue.

This woman was quite hypersensitive and rather difficult to treat because of her multitude of complaints. It was considered that surgical therapy was singularly successful in this case because of the patient's complete satisfaction with the results and because she had no complaints thereafter.

CASE 3.—A 52-year-old left-handed stenographer was referred for treatment of "arthritis" on February 22, 1956. Her complaints had begun gradually four months previously. Just before the onset of her symptoms, she crushed the distal portion of her thumb in a car door and following this she had pain in her left wrist on typing and on opening a stiff filing cabinet. She noted pain on moving her thumb or flexing her wrist. She had no night pain and did not drop objects. She had noted no previous trouble. Her mother had severe, crippling rheumatoid arthritis and the patient was very apprehensive about her wrist disability.

On examination there was a tender, firm swelling on the lateral side of the wrist just above the radial styloid process in the region of the abductor tendons. There was some limitation to full abduction of the left thumb and Finkelstein's sign was positive. At operation, the tendon sheath of the abductor pollicis longus and extensor pollicis brevis was greatly thickened, measuring 1.0 to 1.5 cm., and the surgeon was surprised that there was any gliding action of the tendons at all. The

tendons were unroofed by resecting the sheath proximally and distally over a total length of about 3.5 cm. A small amount of synovial fluid was encountered on opening the sheath. Since operation she has had no pain or discomfort in her wrist or thumb.

CASE 4.—A 47-year-old woman occupied as a companion to an elderly aunt had pain in the right wrist of 13 months' duration. This began when she was attempting to pull up her aunt's coat and the aunt sat on her hand. She described her discomfort as a steady aching, aggravated by thumb movements but not by movements of the other fingers. She had pain on grasping objects, although she did not drop them. She was unable to knit, one of her favourite occupations. She also had pain at night with any movement and with the pressure of the bedclothes on her arm. This disorder had been treated as a sprain of the wrist, with application of a cast for at least four months during this period. She also had injections of hydrocortisone without relief.

On examination, she had a fairly obvious swelling over the lower radial aspect of the right wrist, approximately 3.5 cm. in length. All movements of the thumb were painful. Finkelstein's sign was positive and she also had pain on forced abduction of the thumb. She had immediate relief with decompression of the tendon sheath and following this was able to knit and sew without distress. She had no family history of "rheumatism" but had a sister who died as a result of rheumatic fever. This was one of the few cases in which operation was performed under local anes-

thesia, and it proved adequate and quite satisfactory in a hypersensitive patient.

SUMMARY

Stenosing tenovaginitis of the wrist (de Quervain's disease) is described, with particular reference to 12 cases seen by the authors. The frequent occurrence of aberrant tendons in the region of the radial styloid process is mentioned as a possible factor in the etiology of this disorder, as is the influence of direct trauma or repetitive strains. Cardinal signs and symptoms are listed and the gross and microscopic changes in the tendon sheaths as seen in these cases and as recently described by other authors are discussed. Three types of treatment have been tried, with a strong recommendation for surgery because of the ease and effectiveness of the procedure. The results of treatment in the authors' 12 cases are summarized and four illustrative cases are presented to emphasize the usual picture.

It is felt that this diagnosis is readily made if the examining physician keeps it in mind and that it may be overlooked if he does not.

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PAGES OUT OF THE PAST: FROM THE JOURNAL OF FIFTY YEARS AGO

XXIII. JOHN SHAW BILLINGS. Among the men of our profession made distinguished by the American Civil War, Dr. Billings takes an unusual position. One hears sometimes that the career of the Army Surgeon offers small scope to a man of capability and energy, but to this the life of Dr. Billings is a strong contradiction. Without special advantages in early life, and without special opportunities during the war itself, he showed such capacity for work and for organization that when peace was declared he was one of the fortunate ones to be selected to utilize the enormous materials that had accumulated during the war. Plenty of opportunities now came to him, and a great one in connection with the Surgeon-General's Library. There have been great bibliographers in medicine since the famous Conrad Gesner wrote his "Bibliotheca Universalis" in 1545, but no one has ever undertaken and carried out to completion so monumental a work of this character as the *Index Catalogue*.

Dr. Billings was born in 1839, and graduated from the Medical College of Ohio in 1860; after a session as demonstrator of anatomy he joined the Northern Army and served throughout the Civil War, at the conclusion of which he was Medical Inspector of the army of the Potomac. He then became attached to the Surgeon-General's Office in Washington.

In utilizing the enormous clinical and statistical material of the war, a serious difficulty arose owing to lack of the necessary works of reference. Surgeon-General Hammond had already started a library in connexion with his office and this formed the beginning of the now famous collection. Dr. Billings was put in charge of the few hundred volumes and given a free hand. With a large annual appropriation, Europe was ransacked for books and files of journals, and the library grew with extraordinary rapidity. In this biblio-

graphical work, the late Dr. Windsor of Manchester acted as his friend and adviser. In the last report, October, 1912, the library is said to contain 178,741 bound volumes and 317,740 pamphlets. The collection is extraordinarily rich in old fifteenth century works, and particularly in the journal literature of the world. Owing to the liberality and freedom with which successive Surgeons-General have allowed its treasures to be utilized, the library has had an important influence upon the medical profession in the United States.

In 1876, as the library began to grow, the question of a printed catalogue was discussed, and a specimen fasciculus was distributed for purpose of criticism. The work progressed slowly, but in 1880 Volume I of an *Index Catalogue* was printed, containing nearly a thousand pages. As subject and author catalogue it was immediately recognized that such a publication would be of the greatest help, but few at that time thought that a work on so vast a scale should be kept up. The literature of every subject was given with extraordinary fullness, though representing only the material available in the library; thus in Volume I under Aneurysm there were some 70 pages of references. Year by year the work progressed, and the first series of sixteen volumes was completed in 1895. Dr. Billings had a happy faculty for choosing able assistants, and he early had the good fortune to associate with him Dr. Robert Fletcher, whose death was noticed in the JOURNAL a couple of months ago. The first volume of the second series was published in 1896, and Volume XVII of Series II has just been issued. The remarkable growth of medical literature is well illustrated by comparing the references on Syphilis in Volume XIV of the first series and Volume XVII of the second; in the one there were 109 pages, and in the other 207.—Sir William Osler: Men and Books, *Canad. Med. Ass. J.*, **3**: 613, 1913.

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