DEQUERVAIN'S DISEASE

AN ANALYSIS OF 52 CASES*

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INTRODUCTION

DEQUERVAIN'S DISEASE is descriptively referred to as stenosing tendovaginitis and synovitis of the abductor *pollicis longus* and extensor *pollicis brevis* at the radial styloid process. It was first noted by a Swiss surgeon, Fritz deQuervain,[4] at Kocher's Clinic in Berne, Switzerland, in 1895. He reported five cases, all of them in women. Although this syndrome was first described by deQuervain[4] in 1895, the condition is still frequently misdiagnosed or goes unrecognized. There is usually no mention of the condition in standard surgical texts.[3] Actually there is mention of "Washerwoman's Sprain" in the 1893 edition of Gray's Anatomy, which is described as being secondary or caused by the wringing of clothes.[7]

Individuals working in skilled trades and those which require manual dexterity are often so hampered by this condition that many hours of work are lost. The disability that accompanies this disease is so marked and the resulting discomfort so distressing, that the afflicted person dislikes using the involved thumb or hand for any reason whatsoever. Bunnell[2] emphasizes that, "A hand without a thumb is no more than a hook." Certainly in a *bona fide* case of deQuervain's Disease, the function of the thumb is so limited as to render it useless for all practical purposes.

Splinting and physiotherapy are of doubtful value other than to afford temporary relief to a crippled hand. The fibrotic processes involving the tendons of the abductor *pollicis longus* and the extensor *pollicis brevis* may be progressive or stationary. In either case, the restricting bands never regress or resolve. Continued motion of the tendons through these constricting sheaths seems to provide for a greater proliferation of scar and fibrous tissue, and to reduce still further the diameter of the lumen through which these tendons must pass. Actually, division and excision of the involved pulleys is the only manner in which the tendons can be liberated from their encasement. As pointed out by Aitken,[1] "The disease is seen frequently in women and rarely in men, and is in a marked increase because of employment of females in industry. Actually there is no adequate explanation of why the condition does not occur more commonly in males."

Unfortunately, most of the cases that ultimately come to operation have been treated for weeks or months with either physiotherapy, splinting, or plaster cast. The inutility of such therapy usually goes unrecognized for a long period of time, until either the patient demands a change in treatment or the condition is recognized in surgical consultation.

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ETIOLOGY

On the dorsum of the wrist, the tendons of the abductor *pollicis longus,* accompanied by the extensor *pollicis brevis,* occupy the first compartment, which is formed by a ligamentous synovial-lined sheath in a shallow groove on the styloid process of the radius. The roof of this compartment is composed of a deep layer of longitudinal fibers, and is strengthened by a superficial layer of transverse fibers from the dorsal carpal ligament. There may be an aberrant tendon in this compartment and the compartment may be bifid. This compartment averages about two and one-half inches in length.

FIG. 1. Finkelstein test. Thumb opposed and clasped by other fingers.

The anatomy of the short extensor tendons of the thumb is best described by Dr. Bryan Keon-Cohen, of Melbourne, Australia.[9] "The extensor retinaculum, a thickening of the deep fascia, bridges the grooves on the dorsal aspects of the lower ends of the radius and ulna, and, being attached by deep processes to the ridges between them, converts them into six osteofibrous canals, in which the various extensor tendons are contained. The first canal corresponds with the groove on the outer side of the lower end of the radius and contains the tendons of the abductor *pollicis longus* and extensor *pollicis brevis.* The abductor tendon is anterior to the extensor tendon, and they are closely applied to one another. The dorsal cutaneous branch of the radial nerve pierces the deep fascia just proximal to the wrist joint. Its three branches, on their way to supply the thumb and radial half of the index finger, pass superficial to the first fibro-osseous canal. The abductor *pollicis longus* is inserted into the radial aspect of the base of the first metacarpal bone and a ridge on the trapezium; it commonly gives off a slip to the abductor *pollicis brevis.* The extensor *pollicis brevis* is inserted into the dorsal aspect of the base of the proximal phalanx of the thumb. It is a muscle peculiar to Man, and unlike the abductor, is not generally represented in lower animals. It is truly in its phylogenetic infancy, as its separation from the abductor is complete only in Man and the gorilla. It has a very much smaller tendon than the abductor *pollicis longus,* a fact scarcely noticed in standard anatomy books. Occasionally it is absent, being represented only by a tendinous ligament passing from the radial styloid to the base of the first phalanx of the thumb."

As pointed out by Bunnell,[2] the tendon of the abductor *pollicis longus* at the styloid process is not only subject to direct tension, but is also subject to an unusual degree of sharp angulations in the various motions of the wrist. In many cases the tendon may angulate to 105 degrees after emerging from its fibrous-osseous canal. The angulation is increased with abduction of the thumb. Because of the divergence of these

two tendons, considerable tension is exerted on the fibrous sheath on extension and abduction of the thumb. But Haggart[8] points out that full abduction of the thumb brings the direction of the pull at right angles to the long axis of the thumb.

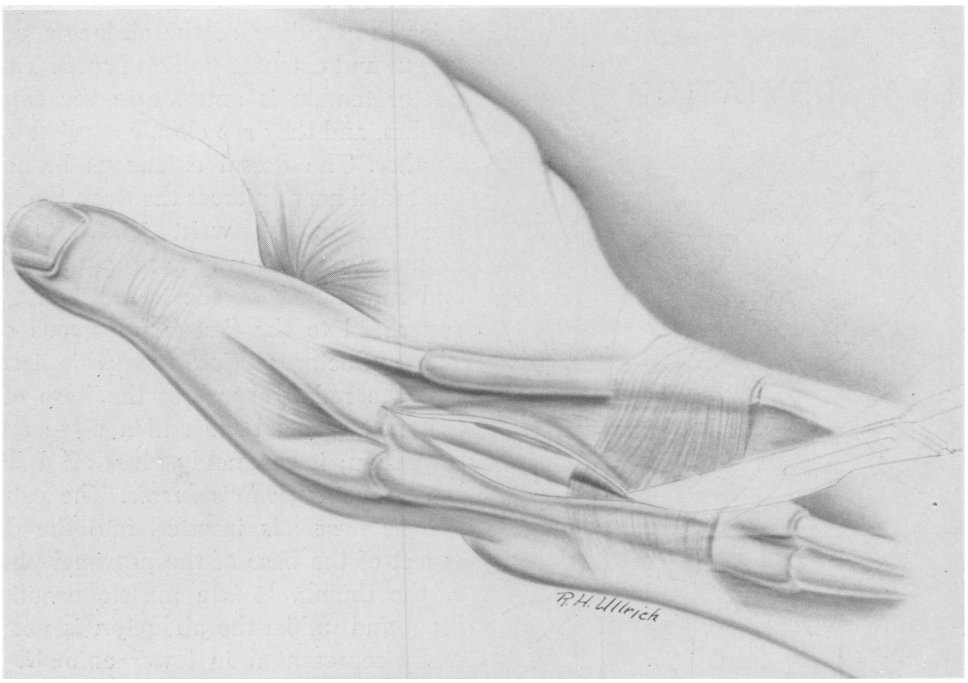

FIG. 2. Depicts the type of longitudinal incision made over the anterior border of the anatomical snuff box with its center at the radial styloid. The pathological processes lie immediately deep to the skin incision.

Stenosing tenosynovitis is quoted by some authorities as being three times more common among women than men, and in this series it seems to be three to one in a study of 52 cases.

It is theorized that this fact is probably explained by the greater joint angulation in women than in men. The onset is usually gradual, and is secondary to repetition of initiating minor strains being almost insidious. The extensor *pollicis brevis* tendon, as stated above, is normally small, and may pass through a separate osseo-fibrous canal. As Eichoff[5] explains: "Work requiring a constantly repeating movement of the wrist, especially in ulnar abduction, with the thumb fixed on some object, with each movement in this position the tendons of the extensor *pollicis brevis* and the abductor *longus* muscles become taut over the styloid process of the radius and press upon the tendon sheath, which is unable to avoid the pressure because it lies close to the bone." He further states that as a second factor, during ulnar abduction of the hand with a fixed thumb, stretching of the entire tendon sheath is produced.

The disease occurs most frequently in manual workers, especially those who pinch with the thumb while moving the wrist. The act of pinching brings the abductor *pollicis longus* into action, as it is a strong stabilizer of the thumb. The onset of symptoms is usually gradual, but it may be

acute following a blow or sudden strain of gripping or lifting. Lipscomb, quoting Diack and Patterson,[10] points out that occupations and avocations which require repeated abduction of the thumb under stress of grasping motions, combined with abduction of the thumb and ulnar deviation of the wrist as in typewriting, knitting, fly casting, golfing, piano playing, and work on grinding and buffing machines, cause this condition.

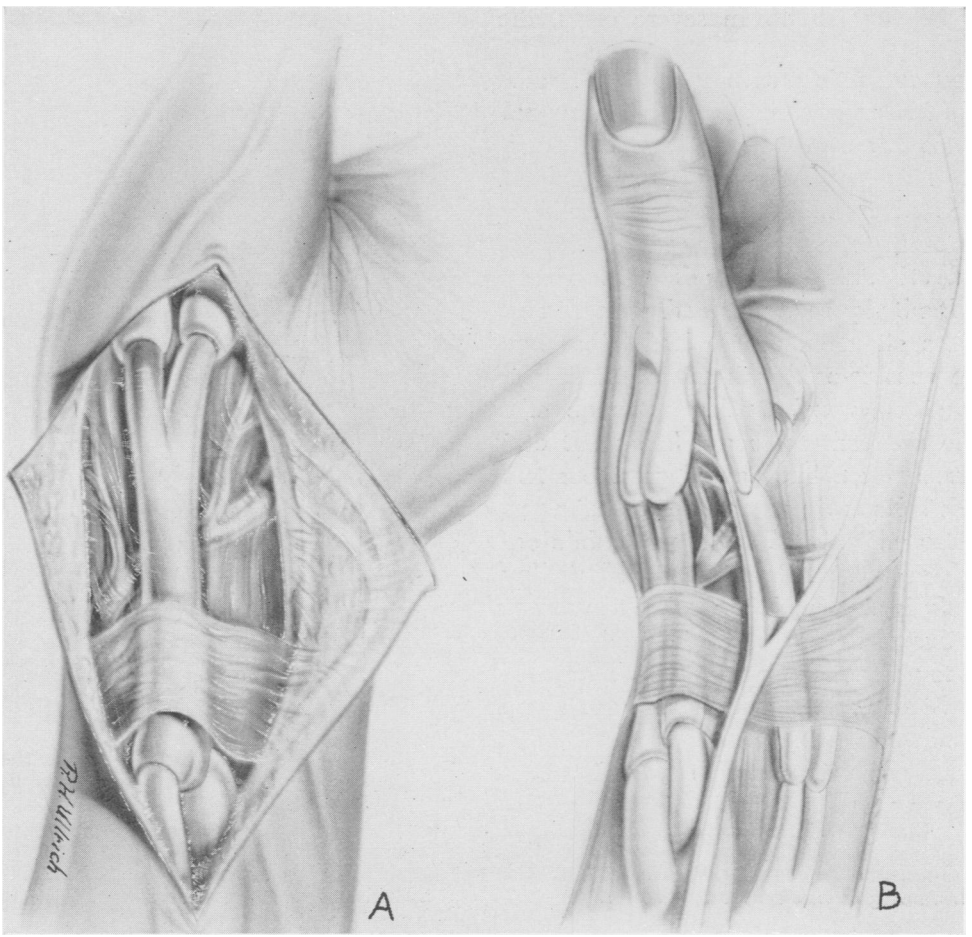

FIG. 3, A and B. Illustrate the anatomical position of the cutaneous branch of the radial nerve and the ease with which it may be injured. By carrying the original incision down to the tendon sheath and then elevating skin flaps with the subcutaneous fascia and fat laterally, the nerve can be retracted laterally with the skin flaps, and thus not be injured.

PATHOLOGIC PROCESS

Pathological changes vary from case to case in the inflammatory response, ranging from the acute to the chronic stage. The characteristic reaction of all synovial membranes to irritation is exudation, which in turn leads to a deposition of fibrin in the sheath. The pathological changes vary from serous effusion within the sheath, with edema and round cell infiltration of sheath wall, through increased vascularity

and thickness of wall, to marked thickening of dense fibrous layers with hyaline degeneration. As in inflammation elsewhere in the body, the resultant pathological findings depend in part upon the duration of the disease. In mild cases the changes may be very slight. In severe cases, the ish, scum-like, lustreless covering. Occasionally free fluid may be present. Film-like adhesions may be present between the tendon and the tendon sheath, and at times between the tendons themselves. There is thickening of the roof of the bony canal with some metaplasia. The tendons are

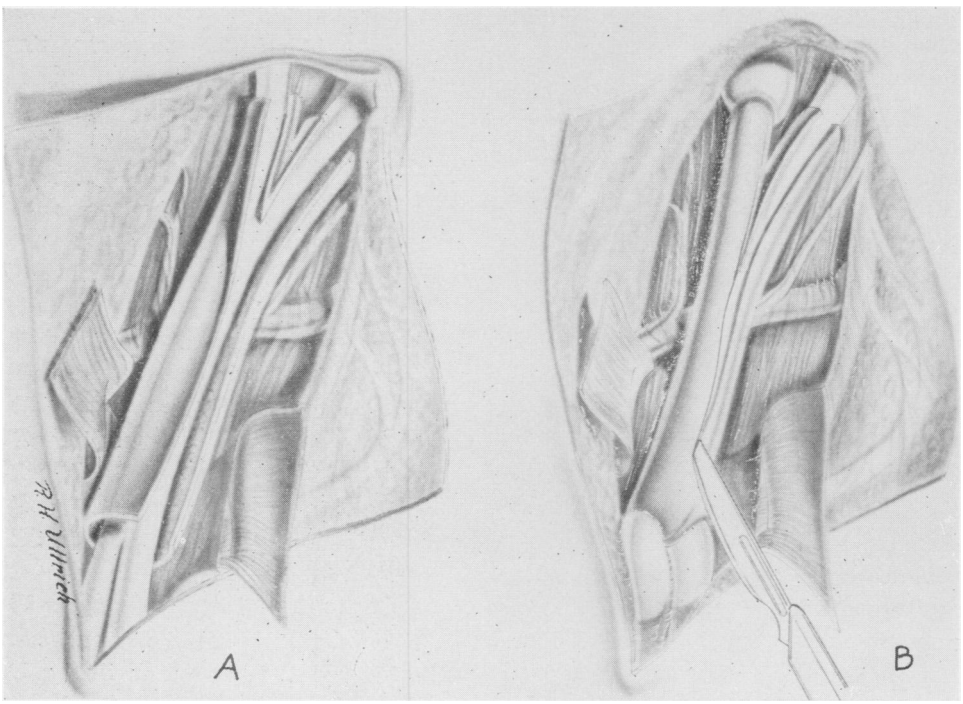

FIG. 4, A and B. Illustrate the division of the dorsal carpal ligament to expose the entire fibrosed tendon sheath and the manner of division of the sheath itself here diagrammatically represented as greatly thickened. Constriction by the sheath and bulging of the tendon has been diagrammatically exaggerated.

tendon sheath, usually about three-quarters of a millimeter in thickness, may be three to four times thicker than normal, being either densely fibrous or even cartilaginous. Both the tendon and the tendon sheath may have lost the normal pearly lustre or sheen, and the epitenon may be involved in an inflammatory reaction and may be discolored, ranging from slight edema to marked congestion (hyperemic). Bunnell[2] states that this congestion may reduce the epitenon to a reddish or brown-

frequently flattened and thinned out at the point of constriction, and may be frayed and covered with granulation tissue. Only rarely, however, is there constriction of the tendon in the stenosing sheath with bulbous enlargement of the tendon above and below the point of constriction.

In some cases, the reaction of the synovial lining is one of proliferation, but in other cases, the synovial lining may be thin or even eroded in places. In all cases, microscopically there is an increase in

fibrous and vascular tissue and myomatous degeneration occasionally has been observed. There are varying degrees of lymphocytic infiltration, and the fibrous tissue is in various stages of maturation, depending on the duration of the disease. Calcareous deposits may occur in the sheath. Perineural fibrosis with lymphocytic infiltration has been observed in some cases and may account for the persistent pain in deQuervain's Disease. The dense connective tissue in the more chronic cases may show hyaline and cartilaginous changes. Finkelstein[6] reproduced the condition experimentally in rabbits by mechanical and chemical means. Phillip Potter[11] theorized that the primary pathologic change may well be limited to the dorsal ligament, and that the variations from normal which are encountered in the sheath and tendons are secondary. Ramsay and Key[12] state that in many instances there is a considerable increase in the number of the smaller blood vessels in the subsynovial tissues. In some cases there is rather marked villous formation. The fibrous wall of the osseo-fibrous canal is uniformly thickened, in some instances to a marked degree. Stein, Ramsey and Key[12] believe that the essential lesion in this condition is "degeneration followed by proliferation and increased vascularity in the roof of the fibrous and bony canal over the styloid process of the radius, and that this was originated through excessive use or trauma coupled with some constitutional predisposition." Whether the proliferative changes or the degenerative changes are primary is not known, but it seems probable that the primary change is degeneration. The secondary increase in vascularity in the production of fibroblasts, resulting in the thickening of the fibrous roof, causes a constriction of its lumen. As a result, constant pressure is exercised on the tendon surfaces within the canal. Here we see the vicious circle of thickening and pressure and further thickening which is so characteristic of this syndrome.

SYMPTOMATOLOGY

The typical picture described by deQuervain consists of pain radiating from the radial styloid process, down the thumb, and up the forearm, slight swelling in the region of the tendon sheath, pain on movement of thumb and wrist, and inability to grasp objects firmly. The chief complaint is either pain in the wrist on using the thumb, or dropping articles because of pain or insecure grip. Strong active abduction of the thumb is painful.

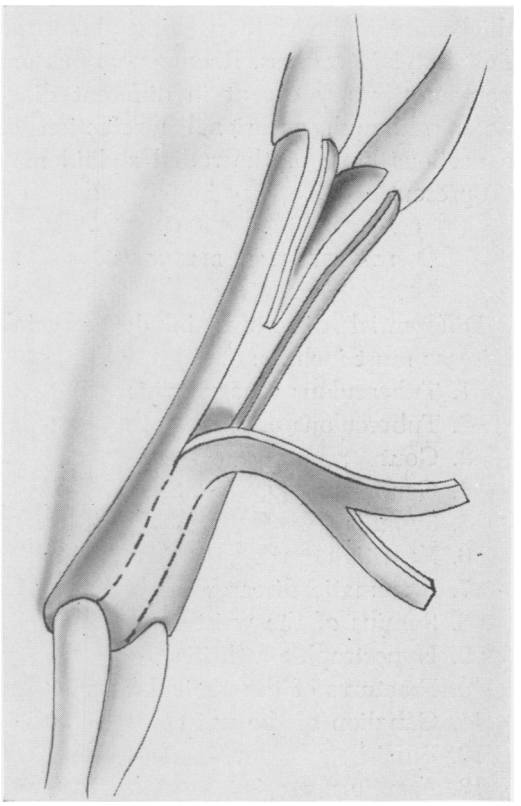

FIG. 5. An insert to emphasize that the tendon sheath should not only be incised, but excised to prevent recurrence of a stenotic sheath.

The Finkelstein test is probably "the most pathognomonic objective sign." Pain,

consequent to strong flexion of the wrist, is also an indication.

As pictured in Figure 1, this test consists essentially in ulnar deviation and opposition of the thumb. To carry this out, the fingers clasp the thumb in an opposed position, prior to ulnar deviation of the wrist. Occasionally there may be found thickening and visible swelling about the radial styloid process. Roentgenograms are non-contributory except in different diagnosis, although occasional rarefaction of cancellous bone of the radial styloid may be present.

DIFFERENTIAL DIAGNOSIS

Differential diagnoses in deQuervain's Disease must include:

1. Tuberculous tenosynovitis
2. Tuberculous osteitis
3. Gout
4. Gonorrhea
5. Syphilis
6. Neuritis
7. Rheumatic diseases
8. Sprains of the wrist
9. Hypertrophic arthritis
10. Fractures of the navicular bone
11. Ganglion of the wrist
12. Bursitis
13. Aseptic necrosis
14. Interstitial calcinosis
15. Senile processes in joint capsules
16. Sprain of external lateral ligament.

In *tuberculous tensynovitis* there is usually considerable bulging, both below and above the dorsal carpal ligament, so as to give an hourglass appearance. Rice bodies may be palpated. *Tuberculous tenosynovitis* is usually a secondary rather than a primary condition, and will be found normally as an extension from a focus of infection in an adjacent bone or joint. The diagnosis of *tuberculous osteitis* can usually be demonstrated by roentgenogram. Gout, gonorrhea and syphilis can be diagnosed with the help of history, blood studies and roentgenologic studies. The rheumatic diseases rarely affect one joint only, and physical findings will be helpful in this instance. Neurological examination and hyperesthesia will aid in the diagnosis of neuritis. Sprain will affect more than just the one localized area. Hypertrophic arthritis and fractures are evidenced roentgenologically, as are also cysts of the navicular. Ganglions present a small, firm, rather fluctuant area that is well circumscribed and localized, as opposed to the findings of deQuervain's disease. Periostitis, when present, will also be in evidence roentgenologically. The last diagnosis, sprain of the exterior lateral ligament, is alone difficult to differentiate.

TREATMENT

Although surgery for this condition can be easily performed under local novocaine, it is more expedient to carry out the procedure under intravenous pentothal anesthesia. In this manner, tissues are not distorted, and the entire procedure is completed in a matter of minutes. A dry operative field is easily maintained with a pneumatic type of tourniquet, maintained at 300 mm. of mercury around the upper arm, to provide a bloodless field. We prefer to drape the hand and wrist with a sterile stockinnette after the extremity has been prepared with ether and zephiran. By simply dividing the stockinnette over the involved area, sterility and asepsis of the operative site are easily maintained, A longitudinal incision, we feel, is advantageous in that there is less chance of injury to the cutaneous branch of the radial nerve, and there is provided better exposure for a more complete operation. The entire pathological process can, in this way, be visualized in its entirety. The center of the incision is made over the tip of the styloid

TABLE I. *Summary of Cases—DeQuervain's Disease.*

	Initials	Age	Sex	Occupation	Duration of Symptoms Prior to Surgery	Time Since Surgery	Results
1.	M. R.	47	F	Switchboard Operator	5 years	3 yrs.– 2 mos.	Excellent
2.	K. McG.	42	F	Publisher	2 mos.	3 yrs.–11 mos.	Excellent
3.	A. P.	54	F	Religious teacher	7 years	5 yrs.	Excellent
4.	S. E.	33	M	Loader	6 weeks	6 yrs.– 9 mos.	Excellent
5.	L. B.	42	F	Sub. Signal Co.	7 mos.	7 yrs.– 9 mos.	Excellent
6.	M. W.	42	F	Inspector	Indefinite	7 yrs.–11 mos.	Excellent
7.	M. S.	57	F	Housewife	6 weeks	8 yrs.–9½ mos.	Excellent
8.	N. L.	51	F	Waitress	2 mos.	9 yrs.	Excellent
9.	M. P.	32	F	Salesgirl	6 mos.	4 yrs.–11 mos.	Excellent
10.	R. C.	32	F	Checker	2 mos.	1 yr. – 7 mos.	Excellent
11.	M. C.	64	F	Housewife	2 mos.	6 yrs.– 2 mos.	Excellent
12.	K. McD.	35	F	Factory worker	9 mos.	9 yrs.– 1 mon.	Excellent
13.	S. F.	53	F	Religious teacher	1 year	3 yrs.–10 mos.	Excellent
14.	I. K.	49	F	Nurse	6 mos.	–2¼ mos.	Excellent
15.	B. T.	50	F	Housewife	2 mos.	2 yrs.–1½ mos.	Excellent
16.	I. G.	31	F	Housewife	4 mos.	2 yrs.– 9 mos.	Excellent
17.	F. F.	50	F	Housewife	4 mos.	1 yr. – ½ mos.	Excellent
18.	M. T.	46	F	Religious teacher	9 weeks	1 yr. – 1 mos.	Excellent
19.	Sr. J. I.	50	F	Religious teacher	5 mos.	2 yrs.– 6 mos.	Excellent
20.	M. F.	56	F	Housewife	6 mos.	–10 mos.	Excellent
21.	E. D.	36	F	Monitor	12 weeks	7 yrs.– 1 mos.	Excellent
22.	R. K.	23	M	Handler	4 mos.	1 yr. – 6 mos.	Excellent
23.	I. K.	47	M	Physician	1 mos.	–11 mos.	Excellent
24.	M. A.	34	F	Machine operator	2 weeks	1 yr. – 6 mos.	Excellent
25.	C. M.	26	M	Auto mechanic	6 mos.	1 yr. – 6 mos.	Excellent
26.	E. C.	31	F	Housewife	8 mos.	1 yr.	Excellent
27.	S. C.	42	M	Plumber	18 mos.	9 weeks	Excellent
28.	R. N.	51	F	Machine operator	6 wks.	2 yrs.	Excellent
29.	S. W.	27	F	Machine operator	3 wks.	2 yrs.	Excellent
30.	F. N.	56	F	Stitcher	9 mos.	1 yr.	Excellent
31.	L. R.	48	M	Riveter	11 mos.	9 mos.	Excellent
32.	N. C.	42	F	Seamstress	19 mos.	9 mos.	Excellent
33.	F. F.	29	M	Laborer	6 weeks	7 weeks	Excellent
34.	W. T.	30	F	Machine operator	3 weeks	2 mos.	Excellent
35.	B. F.	30	F	Painting	5 weeks	2½ mos.	Excellent
36.	T. T.	44	F	Packer	10 mos.	7 mos.	Excellent
37.	O. T.	53	M	Laborer	5 mos.	1½ years	Excellent
38.	L. T.	21	F	Salesgirl	2½ yrs.	9 mos.	Excellent
39.	W. N.	37	F	Fitter	4 mos.	6 mos.	Excellent
40.	G. B.	33	M	Mechanic	18 mos.	4 mos.	Excellent
41.	D. K.	55	F	Cutter	5 mos.	8 mos.	Excellent
42.	S. C.	54	M	Finisher	1½ yrs.	8 mos.	Excellent
43.	H. G.	44	M	Carpenter	7 mos.	1 yr.	Excellent
44.	C. D.	29	F	Cutter	11 mos.	6 mos.	No improvement
45.	M. D.	45	F	Cutter	3 mos.	10 mos.	Excellent
46.	L. D.	45	M	Laborer	3–4 mos.	1 yr. – 1 mos.	Excellent
47.	M. J.	41	F	Packer	1 mos.	1 yr. – 1 mos.	Excellent
48.	D. D.	17	F	Student	6–7 mos.	3 yrs.– 2 mos.	Excellent
49.	A. C.	58	F	Housewife	Several months	2 yrs.	Excellent
50.	H. McI.	29	F	Packer	10 mos.	1 yr. – 6 mos.	Excellent
51.	A. B.	42	F	Waitress	7 weeks	1 yr. – 6 mos.	Excellent
52.	V. B.	38	M	Truck driver	1 month	1 month	Excellent

process, and the carpal ligament is incised. The tendons affected are easily recognized, as they form the volar or anterior boundary of the anatomical snuffbox.

Figures 2, 3, 4 and 5 illustrate the operative procedure which should be carried out in "step-like" fashion to avoid injury to the cutaneous branch of the radial nerve. It has been demonstrated by us, both at the operating table and in the dissecting laboratory, that a vertical linear incision directly over the two involved tendons is superior to a transverse incision. This incision has the added advantage that it can

be extended for greater exposure, and demonstrates the entire extent of the involved constricting sheath. Arguments have been presented against this approach. It is said that vertical incisions are prone to develop keloid scars, but such has not been our experience. The incision need only be 2 or 2½ inches in length. Both the proximal and distal aspects of the constricting sheath could be identified prior to any remedial surgery. The advantages of the vertical incision definitely outweigh its disadvantages.

The involved sheath is then divided longitudinally, taking care not to injure the tendon or epitenon. To prevent a recurrence and to preclude any further disability resultant from a readherence of the cut ends of the sheath, the divided edges of the sheath should be trimmed away, removing as much of the sheath as possible. Once liberated, the tendon will resume its normal shape. No subcutaneous suturing is necessary, but rather a simple approximation of skin edges. A firm gauze dressing reinforced with an elastic bandage is then applied. Splinting and the application of plaster casts should be avoided, and early motion instituted on the day after operation. Complete and immediate relief of pain is the proof of a successful surgical procedure. A full range of motion and use of the thumb for all purposes is encouraged on the first day after operation.

RESULTS

Table I summarizes the findings and results in 52 cases of deQuervain's disease. Of this number, 24 were carried out by staff members of St. Elizabeth's Hospital, Brighton, Massachusetts, and six by staff members of the Carney Hospital, South Boston, Massachusetts.

It is apparent that the disease is more prone to occur in women. Of the 52 patients undergoing surgery, there were 39 females as opposed to 13 males, or a ratio of 3 to 1. The average age was 41.5 years, with a maximum of 64 and a minimum of 17.

It is difficult to designate this disease an occupational disease, but in this group of 52 cases, "the vast majority were individuals accustomed to work with their hands."

It is obvious that the duration of symptoms prior to surgery is extremely long, with a maximum of nine years and one month, and an average of eight months.

The results were almost uniformly excellent, and all the patients claimed immediate relief of discomfort on the day after operation. There was one case listed as "no improvement," which can be attributed possibly to a co-existent severe arthritic condition of the wrist.

CONCLUSION

1. DeQuervain's Disease, although frequently unrecognized, is a crippling condition which is easily remedied by surgery.

2. There has been demonstrated a technic which is simple to follow and avoids injury of the cutaneous branch of the radial nerve.

3. The condition is far more prone to occur in women, and this pathologic condition should be considered in the differential diagnosis of persistent pain at the base of the thumb in the region of the radial styloid.

4. Surgery is the only treatment for this condition, and should be carried out as soon as possible.

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