Treatment of carpal and digital ganglions by simple aspiration, or aspiration and injection of corticosteroid and/or hyaluronidase

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JT Seki, MSG Bell. Treatment of carpal and digital ganglions by simple aspiration, or aspiration and injection of corticosteroid and/or hyaluronidase. Can J Plast Surg 1997;5(4):233-237. This retrospective study examined the treatment outcome of 178 carpal and digital ganglion cysts by simple aspiration or aspiration and injection of corticosteroid (triamcinolone acetonide 40 mg/mL) and/or hyaluronidase in 174 patients between 1987 and 1995. A total of 106 ganglions were treated with aspiration and triamcinolone acetonide injection; the cumulative cure rates were 45.3%, 50.0% and 53.8% following one, two or three treatments, respectively. The cure rates were similar in 23 ganglions in the hyaluronidase group: 43.5%, 52.2% and 56.5%, respectively. Seventeen of the 23 ganglions treated with a combination of triamcinolone acetonide and hyaluronidase recurred, yielding success rates of 17.4% and 26.1% following two or three treatments, respectively. Twenty-six ganglions were treated with simple aspiration. Of these, 23 were volar digital ganglions. The success rates were 61.5% and 69.2% following one or two treatments, respectively. The overall success rate was 94 of 178 (52.8%) after a maximum of three treatments, regardless of the type of treatment and the anatomical location of the ganglions. This study provided baseline data following nonoperative management of ganglions; the data can be compared with those from a planned prospective randomized clinical trial involving the use of rolitetracycline as a sclerosing agent, which is currently under review by the Ethics Committee at the authors' institution.

Key Words: *Chart review, Corticosteroid, Ganglion cysts, Hyaluronidase, Simple aspiration*

Traitement des ganglions carpiens et digitaux par simple aspiration ou aspiration et injection de corticostéroïdes et/ou d'hyaluronidase

RÉSUMÉ : Cette étude rétrospective se penchait sur les résultats du traitement de 178 kystes des ganglions carpiens et digitaux par simple aspiration ou aspiration et injection de corticostéroïdes (acétonide de triamcinolone à 40 mg/mL) et/ou d'hyaluronidase chez 174 patients entre 1987 et 1995. En tout, 106 ganglions ont été traités par aspiration et injection d'acétonide de triamcinolone; les taux de guérison cumulatifs ont été de 45,3 %, 50,0 % et 53,8 % après un, deux ou trois traitements, respectivement. Les taux de guérison ont été semblables pour 23 ganglions traités à l'hyaluronidase : 43,5 %, 52,2 % et 56,5 %, respectivement. Dix-sept des 23 ganglions traités par acétonide de triamcinolone combiné à l'hyaluronidase sont revenus, donnant des taux de succès de 17,4 % et 26,1 % après deux ou trois traitements, respectivement. Vingt-six ganglions ont été traités par simple aspiration; parmi ceux-ci, 23 étaient des ganglions digitaux palmaires. Les taux de succès ont été de 61,5 % et 69,2 % après un ou deux traitements, respectivement. Le taux de succès global a été de 94/178 (52,8 %) après un maximum de trois traitements, peu importe le type de traitement et la localisation des ganglions. Cette étude a fourni les données de base après un traitement non chirurgical des ganglions. Les données peuvent être comparées à celles d'essais cliniques randomisés prospectifs prévus mettant en jeu le recours à de la rolitétracycline comme agent sclérosant, intervention actuellement étudiée par le comité de déontologie de l'établissement des auteurs.

Ganglion cysts comprise 50% to 70% of all soft tissue tumours of the hand (1). They are most commonly found on the dorsal aspect of the wrist, followed by the anterior wrist (2-7). Their respective origins are the scapholunate

ligament and the scaphotrapezoid ligament/radiocarpal joint capsule (5,8-10). Their etiology remains elusive. However, postulated pathogenesis of ganglions include retention cysts, herniation of tendon or capsular synovium, bursal transformation, neoplasm and mucinous degeneration of connective tissue (2,6,8,11,12). Most patients present with mild local tenderness, discomfort or mild weakness that limits, in some way, their activities of daily living.

Various conservative methods have been previously ad-

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Figure 1) Frequency distribution of patient age at presentation

Figure 2) Frequency distribution of the types of treatment

vocated for the treatment of carpal and digital ganglions. These include manual rupture, needle aspiration with or without injection of corticosteroids and sclerosing agents, all with varying success rates (1-4,6,7,9,13,14,16), which indicates that there is no established definitive treatment. The purpose of this study is to evaluate the treatment outcome following simple aspiration or aspiration and injection of corticosteroid and/or hyaluronidase.

PATIENTS AND METHODS

Between 1987 and 1995, 350 patients were selected for chart review. (Excluded were patients with mucous cysts of the distal interphalangeal joint and those who had previous surgical or nonsurgical treatment for carpal and digital ganglions.) These 350 patients were seen in the private office or the plastic surgery clinic by one surgeon at our hospital. The skin overlying each ganglion was prepped and locally infiltrated with 1% or 2% xylocaine with adrenaline, using a 25 gauge needle followed by simple aspiration with an 18 gauge needle, or aspiration and injection with corticosteroid (triamcinolone acetonide 40 mg/mL) or hyaluronidase. The ganglions were localized to the dorsal wrist, volar wrist and volar aspect of digits. There was no restriction in activity post-treatment. Patients treated on subsequent visits with triamcinolone acetonide and hyaluronidase were classified under a separate treatment group. In the majority of digital ganglions, only aspiration was performed because localiza-

Figure 3) Frequency distribution of ganglion location

Figure 4) Frequency distribution of ganglion size

tion was too difficult to facilitate injection of one of the two agents.

Of the 350 patients, 174 with 178 carpal and digital ganglions were contacted by telephone after multiple attempts over an eight-week period. Specific questions asked during the telephone interview included whether there was recurrence of the ganglion; how soon after the first treatment recurrence was noticed; and if specific adverse reactions were encountered, ie, redness, swelling or skin colour changes at the site of the injection. Patient responses were recorded only if they were certain upon questioning. This information, along with patient files, provided the database with which cure rates were calculated.

RESULTS

In this series of 174 patients with 178 ganglions, follow-up to the time of the telephone interview averaged 35.1 months (range four to 109 months). There were 49 males and 125 females; average age was 40.1 years (range 14 to 75 years, Figure 1). There were four treatment categories: triamcinolone acetonide; triamcinolone acetonide plus hyaluronidase; hyaluronidase; and simple aspiration (Figure 2). Anatomical location of the ganglions include dorsal wrist (98 of 178, 55.1%), volar wrist (33 of 178, 18.5%) and volar aspect of digits (47 of 178, 26.0%) with 96 right-sided and 82 left-sided (Figure 3). Bilateral ganglions were present in three patients. Carpal tunnel syndrome, ipsilateral to the side of the

TABLE 1
Treatment results

TREATMENT/ location	Cure rates specific to treatment			Recurrence after 1, 2 or 3 treatments	Cure rates specific to anatomical site
	After 1 treatment	After 2 treatments	After 3 treatments		
TRIAMCINOLONE ACETONIDE					
Dorsal wrist	30	3	3	30	36/66 (54.5%)
Volar wrist	6	1	0	16	7/23 (30.4%)
Volar digits	12	1	1	3	14/17 (82.4%)
Total # of patients treated: 106	Total: 48 Cure rate: 45.3%	Cumulative total: 53 Cure rate: 50.0%	Cumulative total: 57 Cure rate: 53.8%	Total: 49	
HYALURONIDASE					
Dorsal wrist	5	1	1	7	7/14 (50.0%)
Volar wrist	2	1	0	2	3/5 (60.0%)
Volar digits	3	0	0	1	3/4 (75%)
Total # of patients treated: 23	Total: 10 Cure rate: 45.3%	Cumulative total: 12 Cure rate: 52.5%	Cumulative total: 13 Cure rate: 56.5%	Total: 10	
TRIAMCINOLONE ACETONIDE AND HYALURONIDASE					
Dorsal wrist	0	3	1	11	4/15 (26.7%)
Volar wrist	0	1	0	4	1/5 (20.0%)
Volar digits	0	0	1	2	1/3 (33.3%)
Total # of patients treated: 23	Total: 0 Cure rate: 0%	Cumulative total: 4 Cure rate: 17.4%	Cumulative total: 6 Cure rate: 26.1%	Total: 17	
SIMPLE ASPIRATION					
Dorsal wrist	0	0		3	0/3 (0%)
Volar wrist	0	0		0	
Volar digits	16	2		5	18/23 (78.3%)
Total # of patients treated: 26	Total: 16 Cure rate: 61.5%	Cumulative total: 18 Cure rate: 69.2%		Total: 8	

ganglion, was documented in 14 of 174 patients (8%). Each patient averaged 1.7 visits (range one to eight). Fifty-three of the 88 measured ganglions were less than 10 mm (Figure 4). The largest ganglion measured 35 mm with a volume of 3.5 mL. Mean duration before recurrence following first treatment was 4.9 months (n=80, range one week to 24 months). Of the 80 patients with recurrence, 62 (77.5%) and 78 (97.5%) experienced recurrence within six months and 12 months, respectively.

One hundred and six ganglions were treated with aspiration and triamcinolone acetonide injection, and the cumulative cure rates were 45.3%, 50.0% and 53.8% following one, two or three treatments, respectively. The cure rates were similar in 23 ganglions in the hyaluronidase group with 43.5%, 52.2% and 56.5%, respectively. Seventeen of the 23 ganglions treated with a combination of triamcinolone acetonide and hyaluronidase recurred, giving success rates of 17.4% following two treatments and 26.1% following three treatments. Twenty-six ganglions were treated with simple aspiration; 23 were volar digital ganglions. The success rates

were 61.5% and 60.2% following one or two treatments, respectively. Cure rates specific to each of the three anatomical sites and the treatment type were also calculated. Results are shown in Table 1. The overall success rate was 52.8% after a maximum of three treatments regardless of the type of treatment and the anatomical location of the ganglions.

One patient reported mild pruritic rash following triamcinolone acetonide injection of a dorsal wrist ganglion which spontaneously resolved after two to three days. Overall, treatments were well tolerated with no reported cases of infection, skin depigmentation or joint pain.

DISCUSSION

All patients were treated and followed by one surgeon. It was our hope that the technical consistency would eliminate operator/observer variance. Our findings of patient demographics regarding age, sex and handedness are consistent with those reported in previous studies (2,4,7,14). The anatomical distribution of ganglions is very similar to that published by Nelson et al (6) in 1972. Various treatment options have been

previously advocated, including surgical excision, subcutaneous dissection with tenotome and a wide range of conservative therapies, such as manual rupture, transfixation with a suture, and needle aspiration with or without injection of corticosteroid, hyaluronidase, proteolytic enzyme or sclerosing agents (2,6,13,14,17-20). With the exception of surgery and needle aspiration with or without corticosteroid/ hyaluronidase injection, other methods have fallen out of favour because of a lack of effect or the risk of potential complications (20,21).

From our data, it is apparent that the cumulative success rates following multiple treatments are more favourable than those after the initial treatment. Unfortunately, the sample size, with the exception of 106 ganglions in the triamcinolone acetonide group, is too small to make any meaningful statistical comparison between the different groups. However, a few general trends deserve comment.

The cumulative success rate of 53.8% for our corticosteroid (triamcinolone acetonide) group was less favourable than results from other studies (hydrocortisone: 26 of 30, 87% [16]; hydrocortisone 25 mg/mL: 19 of 22, 86% [13]; triamcinolone: 24 of 37, 65% [6]; methylprednisolone 40 mg/mL: 27 of 34, 79% [4]). Our larger sample sizes may be more representative of the true population mean. Nevertheless, by any clinical standards, a success rate of 53.8% is unsatisfactory. Our larger sample sizes may be more representative of the true population mean.

Compared with dorsal wrist and digital ganglions, volar wrist ganglions were observed to be most recalcitrant to treatment. This concurs with results from a study by Wright et al (9) in 1994 in which 20 of 24 volar wrist ganglions recurred following aspiration and corticosteroid injection. The reason that volar wrist ganglions may have higher recurrence rate may be explained in a study by Andren and Eiken (8) in 1971, in which 85% of volar wrist ganglions were found to have a communication with the wrist joint following arthrograms compared with 44% of dorsal wrist ganglions.

Volar digital ganglions appeared to have the highest cure rates in any treatment group, which is consistent with previous studies (17,22). To our knowledge, there are no studies that demonstrate a communication between digital ganglions and the flexor tendon sheath. If we propose that there is an increased risk of recurrence in the presence of a communication between the ganglion and the joint space, its corollary must state that the absence of a communication between a flexor tendon sheath and a digital ganglion will reduce its recurrence (17).

A limitation of this study is the small sample size, which questions the validity of any study and makes inferences regarding the general population inaccurate. Sample sizes under 30, as in three of the four treatment groups, will generally fail to produce any statistical significance in its analysis.

Of the 350 eligible patients for the study, only 174 were reached by telephone, giving a response rate of 49.7%. A flaw of telephone interviewing is the introduction of recall error, especially for events that occurred as long as eight years ago. We attempted to minimize this by asking mostly for yes/no responses and by recording the data only when patients were certain of their responses.

Overall, the results following conservative treatment were relatively poor considering that spontaneous regression rates of 38% to 58% have been observed in the absence of any treatment (2,14,23).

It has been suggested that surgery offers the best success rate (4) provided that radical excision – removal of the cyst, stalk and the ‘base plate’ (consisting of a circular segment of a joint capsule) – is performed (14,24,25). Success rates of 95% to 100% following adherence of the above guideline have been reported (14,24). However, it is our opinion that ganglions are benign lesions, and as such, we must adhere to the principle of “First, do no harm”. We believe that surgery is too invasive a procedure for a gain that is proportionately minimal and should never be advocated for a primary lesion. For patients who seek the surgical option, potential complications must be made understood and the possibility of harm outweighing benefit must be emphasized. Despite the effectiveness of surgery, its potential complications, prolonged recovery time, loss of productivity and high cost (estimated in 1987 at US\$1200 compared with US\$100 for an office aspiration) have already rendered this option less popular (3).

At our institution the various nonsurgical methods employed in the treatment of ganglions have yielded unsatisfactory results. However, given our bias for conservative management for this condition we are currently awaiting approval to commence a prospective randomized controlled clinical trial using rolitetracycline as a sclerosing agent following aspiration of carpal and digital ganglions. To our knowledge, tetracycline (rolitetracycline) has not been used as a sclerosing agent in the treatment of ganglion cysts. Tetracycline has been successfully administered in sclerotherapy in a variety of clinical situations (15,21,26-30). In addition, rolitetracycline is inexpensive, simple to administer and has no significant recovery time, all of which fulfil the criteria for an ideal therapeutic agent.

REFERENCES

- Angelides AC. Ganglions of the hand and wrist. In: Green DP, ed. *Operative Hand Surgery*, 2nd edn, vol 3. New York: Churchill Livingstone, 1988:2283-98.
- Carp L, Stout AP. A study of ganglion, with reference to treatment. *Surg Gynecol Obstet* 1928;47:460-8.
- Zubowicz VN, Ishii CH. Management of ganglion cysts of the hand by simple aspiration. *J Hand Surg* 1987;12A:618-20.
- Holm PCA, Pandey SD. Treatment of ganglia of the hand and wrist with aspiration and injection of hydrocortisone. *Hand* 1973;5:63-7.
- Seidman GD, Margles SW. Dorsal wrist ganglion presenting as anterior wrist ganglion. *J Hand Surg* 1994;19A:959-60.
- Nelson CL, Sawmiller S, Phalen GS. Ganglions of the wrist and hand. *J Bone Joint Surg* 1972;54A:1459-64.
- McEvedy BV. Simple ganglia. *Br J Surg* 1962;49:585-94.
- Andren L, Eiken O. Arthrographic studies of wrist ganglions. *J Bone Joint Surg* 1971;53A:299-302.
- Wright TW, Cooney WP, Ilstrup DM. Anterior wrist ganglion. *J Hand Surg* 1994;19A:954-8.

10. Greendyke SD, Wilson M, Shepler TR. Anterior wrist ganglion from the scaphotrapezoid joint. *J Hand Surg* 1992;17A:487-90.
11. Zachariae L, Vibe-Hansen H. Ganglia: Recurrence rate elucidated by a follow-up of 347 operated cases. *Acta Chir Scand* 1973;139:625-8.
12. Soren A. Pathogenesis and treatment of ganglion. *Clin Orthop* 1966;48:173-9.
13. Derbyshire RC. Observations on the treatment of ganglia, with a report on hydrocortisone. *Am J Surg* 1966;112:635-6.
14. Hvid-Hansen O. On the treatment of ganglia. *Acta Chir Scand* 1970;136:471-6.
15. Treece GL, Georgitis WJ, Hofeldt FD. Resolution of recurrent thyroid cysts with tetracycline instillation. *Arch Intern Med* 1983;143:2285-7.
16. Becker W. Hydrocortisone therapy in ganglia. *Industr Med Surg* 1953;22:555-7.
17. Richman JA, Gelberman RH, Engber WD, et al. Ganglions of the wrist and digits: Results of treatment by aspiration and cyst wall puncture. *J Hand Surg* 1987;12A:1041-3.
18. Dao LJ. A new method of treatment of ganglions and synovial cysts. *J Occup Med* 1964;6:217-20.
19. Ball EJ. A new treatment of ganglion. *Am J Surg* 1940;50:722-3.
20. Mackie IG, Howard CB, Wilkins P. The dangers of sclerotherapy in the treatment of ganglia. *J Hand Surg* 1984;9B:181-4.
21. Key JA. Treatment of ganglion by injection of caroid. A Dangerous Procedure. *JAMA* 1942;118:516-7.
22. Korman J, Pearl R, Hentz VR. Efficacy of immobilization following aspiration of carpal and digital ganglions. *J Hand Surg* 1992;17A:1097-9.
23. McEvedy BV. The simple ganglion: A review of modes of treatment and an explanation of the frequent failures of surgery. *Lancet* 1954;i:135-6.
24. Angelides AC, Wallace PF. The dorsal ganglion of the wrist: Its pathogenesis, gross and microscopic anatomy, and surgical treatment. *J Hand Surg* 1976;1:228-35.
25. Bogumill GP, Sullivan DJ, Baker GI. Tumors of the hand. *Clin Orthop* 1975;108:214-22.
26. Goldfarb WB, Bigos ST, Nishiyama RH. Percutaneous tetracycline instillation for sclerosis of recurrent thyroid cyst. *Surgery* 1987;102:1096-100.
27. Rencken RK, Bornman MS, Reif S, et al. Comparative trial of sclerotherapy for hydroceles. *Br J Urol* 1990;65:382-4.
28. Echavez MI, Lee KC, Sooy CD. Tetracycline sclerosis for treatment of benign lymphoepithelial cyst of the parotid gland in patients infected with human immunodeficiency virus. *Laryngoscope* 1994;104:1499-502.
29. El-Mufti M. Sclerotherapy of the human gall bladder using ethanol and tetracycline hydrochloride. *Br J Surg* 1993;80:916.
30. Sitzmann JV, Dufresne C, Zuidema GD. The use of sclerotherapy for treatment of post mastectomy wound seromas. *Surgery* 1983;93:345-7.
31. Walker-Renard PB, Vaughn LM, Sahn SA. Chemical pleurodesis for malignant pleural effusions. *Ann Intern Med* 1994;120:56-64.