Comparative Study of Recurrence and Complications Using Various Sclerosants by Single Dart Technique in Treatment of Ganglion Cysts

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Received: 6 May 2012 / Accepted: 18 July 2012 / Published online: 28 July 2012
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Abstract Ganglion cysts are tense, smooth, fluctuant, cystic and transilluminant swellings. They are commonly found on the dorsum of the wrist, at the scapholunate articulation and may involve volar wrist, tendon sheaths and even interphalangeal joints. This study aims to compare the efficacy and the recurrence rates with triamcinolone, hyaluronidase and sodium tetradecyl sulphate, using the single dart technique. This prospective observational study was conducted on patients who presented to the general surgery outpatient department of our institute with ganglion cysts of wrist between January 2010 and August 2011 (20 months). A total of 180 patients were included in this study. The difference in the recurrence rates after sclerotherapy for ganglion cysts is statistically not significant between triamcinolone and hyaluronidase regimens as $Z (P1-P2)=1.70, p>0.05$ but the difference in the recurrence rates after sclerotherapy for ganglion cysts is statistically significant between triamcinolone and sodium tetradecyl sulphate regimens as $Z (P1-P2)=3.34, p<0.05$. Chi-square value $-10.33 (2^\circ \text{ of freedom}), p=0.00571987$ (significant at 5 % level). Intralesional injection of triamcinolone by single dart technique, therefore, may be considered as a simple, safe, cost effective, convenient, less invasive alternative to surgical excision of wrist ganglion cysts.

Keywords Ganglion · Triamcinolone · Hyaluronidase · Sodium tetradecyl sulphate

Introduction

Ganglions are tense, smooth, fluctuant, cystic transilluminant swellings. They are the commonest variety of soft tissue tumors of hand [1]. They are most commonly found on the dorsum of the wrist overlying the scapholunate articulation, but may also involve the volar aspect of the wrist, tendon sheaths, and even interphalangeal joints. Histopathologically they are characterized by myxomatous degeneration of the synovial sheath of the concerned joint/tendon. These cysts are nonneoplastic, filled with jelly-like material and may present with chronic pain, inflammation, reduced joint mobility, and even paresthesia [2].

These cysts do not have a true epithelial lining and are therefore pseudocysts. The main aim of treatment is to reduce the production of the gelatinous substance contained within it, rather than excision of the cyst. Various procedures have conventionally been used to treat a ganglion cyst, namely, aspiration of the cyst, injection of sclerosant into the cyst, threading of the cyst, and finally surgical extirpation of the cyst (including debridement of the joint capsule). Surgery requires meticulous excision of the whole ganglion complex to prevent recurrence, while protecting the adjacent tendon pulleys and neurovascular bundles. Unfortunately all of these procedures have high recurrence rates due to remnant tissue resulting from inadequate excision [3].

This study aims to compare the efficacy, recurrence rates, and complications with triamcinolone, hyaluronidase, and sodium tetradecyl sulfate; the sclerotherapy agents used most commonly in the treatment of ganglion cysts, using the single dart technique.

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Fig. 1 Dorsal wrist ganglion

Material and Methods

This prospective observational study was conducted on patients who presented to the general surgery outpatient department at our institute with simple ganglion cysts of the wrist between January 2010 and August 2011 (20 months). A total of 180 patients were included in this study.

Inclusion criterion—all patients with wrist ganglion.

Exclusion criterion—patients with immunocompromised status (T2DM, HIV, etc.)

Local skin lesions (eczema/tinea, etc.)

Complex palmar ganglion

The patients were categorized in the following way:

- Every first patient—triamcinolone used
- Every second patient—hyaluronidase used
- Every third patient—sodium tetradecyl sulfate used

There were 60 patients in each category. Ganglion cysts were diagnosed on clinical examination (Fig. 1). Sclerotherapy was performed using the single dart (i.e., single puncture) method. The cyst wall was punctured with a sterile wide-bore (16-gauge) needle after taking standard aseptic precautions (Fig. 2). The gelatinous content of the cyst was aspirated assisted by gentle compression of the ganglion

Fig. 3 Ganglion being aspirated

(Fig. 3). After the cyst was emptied, the syringe was detached from the needle while keeping the needle in situ (Fig. 4).

Then another syringe filled with the sclerosant solution was attached to the needle and the cyst was refilled with 2 ml of sclerosant to achieve a size more or less equal to the pre-sclerotherapy size (Fig. 5). Proper care was taken not to overstretch the ganglion. The needle was removed and the puncture site was sealed with a sterile swab.

This procedure was repeated monthly for 3 months. This single dart technique used here is a modification of the double dart technique [3]. The patients were advised to use pressure bandage at the wrist for 15 days after each injection for splintage. All the patients were followed up for at least 6 months after the last injection, maximum follow-up period being 18 months.

Results

Out of total 180 patients, 118 were females and 62 were males showing female preponderance. The age of the patients ranged from 24 to 52 years (the highest incidence between 26 and 38 years, $76/180=42.22\%$). Dorsal ganglia were commoner than volar ganglia ($112/180=62.22\%$). All

Fig. 2 Needle inserted into ganglion

Fig. 4 Needle kept in situ after aspiration

Fig. 5 Sclerotherapy agent injected into ganglion

the patients had post procedure wrist pain which resolved with analgesics.

The results were shown in Table 1.

The difference in the recurrence rates after sclerotherapy for ganglion cysts is statistically not significant between triamcinolone and hyaluronidase regimens as $Z (P1-P2)=1.70, P>0.05$.

The difference in the recurrence rates after sclerotherapy for ganglion cysts is statistically not significant between hyaluronidase and sodium tetradecyl sulfate regimens as $Z (P1-P2)=1.61, P>0.05$.

But the difference in the recurrence rates after sclerotherapy for ganglion cysts is statistically significant between triamcinolone and sodium tetradecyl sulfate regimens as $Z (P1-P2)=3.34, P<0.05$.

Alpha level of 0.05 has been considered, which is within 95 % confidence interval of each sample statistics.

Discussion

Ganglion cysts are most common benign soft tissue swellings around the wrist. They are commoner in the dorsal

aspect of the wrist than the volar aspect and may present as a painful or painless swelling, sometimes leading to restriction of joint movement as well as hand paresthesia [4].

Generally these cysts are filled with gelatinous fluid and found adjacent to a tendon sheath or capsule of a synovial joint. That is why they are believed to arise from chronic irritation of the adjacent tendons, ligaments or joints. Commonly these cysts communicate with the neighboring tendon sheath or synovial joint via pedicles [5].

Various procedures have been tried out for permanent cure of a ganglion cyst. Unfortunately, all have presented with considerable recurrence rates. In the past, topical plaster, local application of heat, and even physically smashing the cyst with heavy books (“Bible therapy”, probably giving the name “Bible cyst” to a ganglion) were tried, but none of them is practiced now. Surgical removal of the cyst is advised if the cyst is painful, getting infected frequently, very large in size, interfering with function or joint mobility or causing sensory neurodeficit. However, surgery is associated with a recurrence rate of 20 %. In comparison, simple aspiration of the cyst immediately relieves the pain but causes recurrence within 3 months in 65 % of patients [6].

Surgical treatment is often associated with grave consequences such as wrist stiffness, pain, and swelling of the hand. There is also evidence of damage to the superficial branch of the radial nerve and palmar cutaneous branch of the median nerve while performing excision of a simple ganglion cyst [7]. Injection sclerotherapy is a good alternative with compatible recurrence rates but with a few side effects, the recurrence rate varying between 10 and 35 %.

Hyaluronidase probably acts by improving liquefaction of the gelatinous content of the cyst [8]. Recurrence rate after hyaluronidase sclerotherapy is reported to be approximately 25 % [9]. Triamcinolone, when injected in the cyst cavity, lies in close contact with mucin-secreting mesenchymal cells of the cyst lining, arresting the secretion of gelatinous fluid into the cavity [10]. Recurrence rate after

Table 1 Comparison of various sclerosants in treatment of ganglia

	Sclerosant	Recurrence	Hypersensitivity reaction	Hypopigmentation	Ulceration	Cost (2 ml)	Wrist stiffness
1.	Triamcinolone	12/60=20 %	Nil	5/60=8.33 %	Nil	Rs. 45	31/60=51.67 %
2.	Hyaluronidase	19/60=31.67 %	2/60=3.33 %	Nil	1/60=1.67 %	Rs. 65	37/60=61.67 %
3.	Sodium tetradecyl sulfate	21/60=35 %	4/60=6.66 %	Nil	3/60=5 %	Rs. 98	43/60=71.67 %

$Z (P1-P2)$ score, P value

1. Triamcinolone vs. hyaluronidase— $Z=1.70, P>0.05$
2. Hyaluronidase vs. sodium tetradecyl sulfate— $Z=1.61, P>0.05$
3. Triamcinolone vs. sodium tetradecyl sulfate— $Z=3.34, P<0.05$

Chi-square value (to compare the recurrence rates of three sclerosants) =10.33 (2 ° of freedom)

$P=0.00571987$ (significant at 5 % level)

triamcinolone sclerotherapy is reported to be approximately 8.4 % [3]. Sodium tetradecyl sulfate, on the other hand, causes obliteration of the cyst cavity, preventing further accumulation of fluid inside the cyst [11]. It is reported to have a recurrence rate of 35 % [12].

Sclerotherapy in treatment of ganglion has commonly been done before using the double-dart technique [3]. In the single-dart method used in our study, the needle was not removed from the cyst cavity following aspiration. The injection of the sclerosant was therefore always ensured to be within the cyst cavity. This reduced the rate of complications, such as hypopigmentation, which were due to subcutaneous extravasation of the sclerosant.

Conclusion

Triamcinolone is a novel sclerotherapeutic agent used for treatment of wrist ganglion by intralesional route. It has a very few side effects with low recurrence rate. Using a single-dart technique eliminates the risk of sclerosant injection outside the cyst cavity, thereby reducing complications. Intralesional injection of triamcinolone by the single-dart technique, therefore, may be considered a simple, safe, cost-effective, convenient, less-invasive alternative to surgical excision of wrist ganglion cysts.

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