Acta Orthop. Belg., 2005, **71**, 528-534

ORIGINAL STUDY

Ganglion cysts of the wrist : A prospective study of a simple outpatient management

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We present the results of a modified minimally invasive surgical technique in the management of ganglia of the wrist. Twenty six ganglia have been treated by this method. The patient satisfaction for the procedure was 92.3%. An average of 2 days were lost off work consequent to the procedure. The use of this technique has resulted in a 77.9% mean resolution in size with 50% of the patients showing complete resolution. There were no recurrences noted in the 2 year follow-up.

Keywords : ganglion ; minimally invasive ; linen.

INTRODUCTION

Ganglia are the most common soft tissue tumours of the hand (*12*). They represent 50% to 70% of all soft tissue tumours of the hand, and in some series, the percentage is even higher (*1*). These soft mucine-filled cysts are usually attached to the adjacent underlying joint capsule or tendon sheath.

Surgical excision of wrist ganglia has been reported to have the best success rates in terms of recurrence ; for example Angelides and Wallace in1976 reported a 99% success rate (*2*). However, the treatment is relatively expensive and can only be offered reliably in a specialist hand centre. Complications of surgery include wound healing problems such as infection, neuroma or keloid formation and the presence of a scar. Other reported complications include scapho-lunate dissociation, joint stiffness, damage to the terminal branches of the posterior interosseous nerve and decreased grip strength along with the risks associated with the use of general anaesthesia and upper limb tourniquet (*16*).

We sought a minimally invasive office procedure with acceptable results in terms of reduction of pain and resolution of size but without the complications mentioned above. Patient satisfaction for this procedure was assessed. At the same time we also present an analysis of the clinical features of patients with ganglia from the Indian subcontinent (table I), an information which is hitherto unavailable from this part of the world.

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Table I. — Clinical profile of patients with ganglia of the wrist

	Age (in years)		Size (in cm)		Duration (in months)	
	M	F	M	F	M	F
Maximum	55	48	3.2	3.0	30	72
Minimum	9.5	14	1.0	0.7	0.25	0.5
Mean	25.3	25.3	2.1	1.9	9.1	14.3
Range	45.5	34	2.2	2.3	29.75	71.5

MATERIALS AND METHODS

All patients presenting to the orthopaedic out-patient clinic at Lok Nayak Hospital, New Delhi with ganglia around the wrist were explained the objective and framework of the intended study. Patients with diabetes, rheumatoid arthritis, immuno-deficient conditions, a history of previous treatment for ganglion and allergy to local anaesthetics were excluded from the study. A fully informed consent was taken, explaining the procedure and its possible complications, namely infection and non resolution of symptoms. The study period extended from January 2002 to January 2004.

The study comprised 26 patients with ganglia who were followed up for a minimum period of 2 years (table I). The male/female ratio was 1:1 with ages varying from 9 to 55 years and a median age of 24 years. The highest incidence was in the 15-25 age group with 12 cases (46.2%) followed by the 25-35 age group with 8 cases (30.8%) (fig 1).

The dominant hand was affected in 12 (46.2%) cases. The ganglia in the dominant hand presented earlier after the onset of the first symptoms (45.5% of the ganglia in the dominant hand presented in the first 2 months as compared to 26% of the ganglia in the non-dominant hand).

Pain was the most common presenting complaint (46.2%) followed by cosmesis (34.6%) irrespective of sex, position of ganglion, or dominance. Overall pain was present in 61.5% of the ganglia.

The time of presentation varied from 7 days to 6 years with the mean being 12 months. Thirty four percent of the patients presented within the first 2 months. It was noticed that 50% of the patients presented within 2 months when the chief complaint was pain compared to only 33% if it was cosmesis.

The size at the time of the presentation varied from 0.7 cm to 3.00 cm, the mean being 1.86 cm. Two measurements were taken for each ganglion perpendicular to each other using a Verneir caliper with minimum calibrations of 1 mm and a mean of those two readings

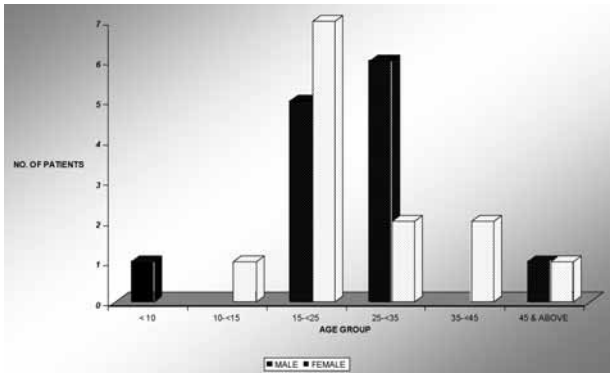

Fig. 1. — Sex specific distribution according to age group

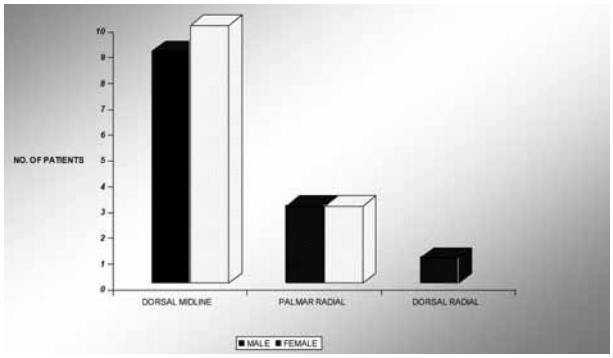

Fig. 2. — Sex specific distribution according to position of ganglia.

recorded. The ganglia in the non-dominant hands presented at a comparatively larger mean size (2.05 cm) as compared to the dominant hand (1.88 cm) [p = 0.191 Mann-Whitney U test].

The most common indication for the procedure was pain (46.2%) followed by cosmesis (34.6%). The ganglion was dorsal midline in 73%, palmar radial in 23% and dorsal radial in 4% of the patients (fig 2).

The surgical procedure was performed in all cases by a single surgeon (R S) and all the patients were followed up for a minimum period of 2 years.

Table II. — Postoperative patient satisfaction score

Parameter	Visual Analogue Score (VAS)
1. Pain	0 = *No pain* 10 = *Unbearable pain*
2. Resolution of presenting complaint	0 = *Complete resolution* 10 = *No resolution*
3. Functional limitation	0 = *No limitation* 10 = *Complete loss of function*

Calculated Score = score of parameter (1 + 2 + 3)/3.
If the score is 2 or less : patient satisfaction is High.
With a score of more than 2 and not higher than 5 : patient satisfaction is Moderate.
With a score over 5 : patient satisfaction is Low.

On the day of the procedure the patients were given 1000mg of Flucloxacillin orally, 1 hour before the procedure. Patients allergic to penicillin received a single dose of Erythromycin 500 mg. Preoperatively, the skin surface over the ganglion was painted with chlorhexidine (fig 3). The region was infiltrated with a mixture of 1% lignocaine and 0.5% bupivacaine. An aspiration was performed to confirm that the swelling under consideration was a ganglion. A clear jelly like fluid was considered to be confirmatory. Following this, a No. 2'0' linen thread (Barbour ; Lisburn N. Ireland) was passed through the swelling in two planes perpendicular to each other (fig 4). Firm pressure and gentle massage at the centre of the ganglion was continued until the swelling completely disappeared. This massage resulted in expulsion of the mucinous contents from the ganglion on to the skin surface. The thread was removed on the 4th day at the time of the 1st dressing. A swab of the discharge was taken from the site to evaluate for culture and sensitivity. Following thread removal, the patients were seen at 6 weeks, 6 months, end of the 1st and 2nd year. During each of these visits, the size of the swelling along with any other complications was assessed (fig 5).

Patient satisfaction was assessed at the first follow-up visit, 6 weeks postoperatively with the help of a questionnaire. Patient satisfaction was classified as high, moderate and low. This was calculated by adding the scores of a Visual Analogue scale for three parameters : pain, patients' perception of resolution in symptoms and patients' perception of functional limitation in the post-operative period (table II). A mean satisfaction score of ≤ 2 was considered as high, between 2 and 5 as moderate, and more than 5 as low.

Fig. 3. — Preoperative photograph of the ganglion.

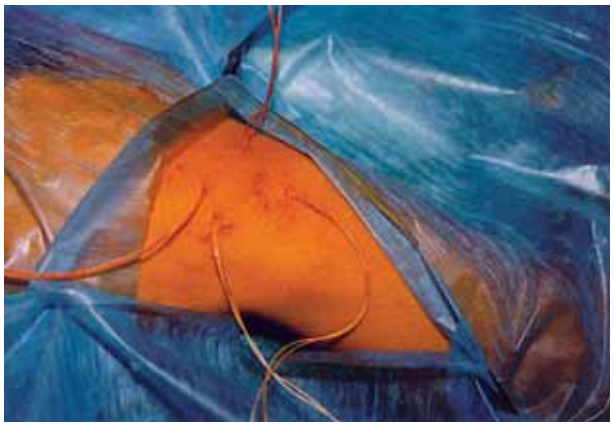

Fig. 4. — Linen thread passed in criss-cross manner ; expelled mucinous contents can be seen at the points of entry of thread..

Fig. 5. — Six weeks later ; no postoperative scar is seen.

Table III. — Evaluation of overall results

% resolution in size	High patient satisfaction	Moderate patient satisfaction	Low patient satisfaction	Reiterated surgery
100%	Excellent	Excellent	Good	Poor
70-99%	Excellent	Good	Fair	Poor
< 70%	Good	Fair	Poor	Poor

Overall results were then calculated on the basis of the percentage of resolution in size and the level of patient satisfaction. Reiterative surgery was classified as poor (table III). Accordingly they were classified into 4 categories : Excellent, Good, Fair and Poor.

RESULTS

Resolution in size

The mean percentage reduction in size was 77.9% with half of the patients showing complete resolution. Residual swellings were seen in patients who had initially presented with complex multi lobulated ganglia. This was confirmed on subsequent Duplex imaging. Surgical exploration and excision biopsy were carried out for two ganglia (one dorsal midline and one palmar) because of persistent pain. These patients did not have any residual swelling in the region. Upon submission to histopathology the excised masses showed abundant fibrous tissue with no remnants of the ganglion.

Results as per resolution of the swelling seemed to be influenced by dominance with 81.8% showing $\geq$ 70% resolution in dominant hands compared to only 60% in non dominant hands [p = 0.148 Mann-Whitney U test]. This was possibly due to a smaller initial size in the dominant hand.

Patient satisfaction

High or moderate satisfaction were obtained in 24 patients (92.3%).

Overall result

An overall success rate (Excellent + Good) of 76.9% was achieved (table III). The 2 patients who were reoperated for persistent pain have been excluded from the successful results.

Two patients developed a mild localised rash and another one developed some mild restriction of hand movement, all of which resolved with time. All the culture reports showed negative results in respect of pathogens. There were no recurrences (reappearance, or increase in the size of swelling following resolution after surgery) noted in the 2 year follow-up.

DISCUSSION

Ganglion is defined as a cystic swelling connected to the joint capsule or tendon sheaths and containing thick gel like material. Microscopically the main cyst, which may be single or multiloculated appears smooth, white and translucent. The wall is made up of compressed collagen fibres and is sparsely lined with flattened cells, without evidence of an epithelial or synovial lining. The capsular attachment of the main cyst reveals mucine filled “clefts” which have been shown by small sections to intercommunicate thereby forming a tortuous and continuous duct connecting the main cyst with the adjacent underlying joint. The contents of a cyst are characterised by a highly viscous, clear, sticky jelly mucine made up of glucosamine, albumin, globulin, and high concentrations of hyaluronic acid.

The recurrence rate of ganglions after operation is quite high. Barnes *et al* stated that in most reviews, the recurrence rate was around 40% (*3*). Zachariae *et al* reported a recurrence rate of 34% in a series of 347 patients who were operated upon in a well established hand clinic (*20*). De Orsay *et al* (*5*) and Posch (*17*) reported recurrence rates of 15% to 20% in their series of surgically treated patients. McEvedy reported a failure rate of 40%

following 'simple' excision (*11*). These recurrence rates were comparable with other modes of therapy such as crushing, aspiration and injection (*3*).

The high recurrence rate of ganglia following simple excision was improved in the following years by the introduction of 'radical' excision, where the ganglia were excised with an underlying portion of the joint capsule. The ganglia were traced to their origin from the scapho-lunate joint during excision. Angelides and Wallace (1976) (*2*) and Clay and Clement(1988) (*4*) achieved recurrence rates of 1-5%. This low recurrence rate was also contributed by the fact that these patients were operated upon by highly experienced hand surgeons, which is not always possible at other centres. However, this procedure had its own complications. Angelides and Wallace reported a loss of volar flexion from 0º to 10º in 6 patients. Also men involved in heavy labour were out of work for 3 weeks. Patients employed in light clerical duties were able to return to work in one week.

Complications reported in other series include persistent pain which may be the result of damage to the terminal branches of the posterior interosseous nerve as they cross the scapholunate ligament or the development of reflex sympathetic dystrophy. Scapholunate dissociation, joint stiffness and decreased grip strength have all been reported and there are also the risks associated with the use of general anaesthesia and upper limb tourniquets (*4, 6, 16*).

Earlier studies involving minimally invasive methods using sclerosants such as STD (sodium tetra decylsulphate) by Mackie, Howard, Willkins (*18*) were largely unsuccessful because they worked on the principle of thrombogenesis due to denudation of endothelium which later got organised. The failure of this procedure can mainly be attributed to the fact that the ganglion lacks a lining epithelium.

Another minimally invasive technique that has gained support in the last 10 years is arthroscopic resection. Arthroscopic resection of dorsal wrist ganglia was first reported by Osterman and Raphael (*14*). This technique used for the dorsal wrist ganglion has an average operation time of 46 minutes with a recurrence rate of 26% (*7*). Other studies report a recurrence rate from 3 to 7% (*9, 15*). It is still not commonly employed for the palmar wrist ganglion. Hung *et al* report an average operation time of 55 minutes with a conversion rate of 20% (*7*). Jacobs *et al* reported a recurrence rate of 28% (*8*). In addition, there was a high risk of laceration to the palmar cutaneous branch of the median nerve (28%), and unsatisfactory scar (28%) (*8*). Wright *et al* also reported a high recurrence rate of 19.4% (*19*). Furthermore, a residual swelling has been seen in 23.5% of the cases which require a repeat aspiration (*9*).

The reigning controversies prompted us to search for a safer and equally reliable office treatment for this soft tissue tumour of the hand. By leaving a linen thread in the ganglion, a foreign body reaction leading to an inflammatory response was created. Linen is a polyfilament braided suture and provokes a strong inflammatory response.

Within 24 hours, there is acute inflammation and by the end of 3 days, due to presence of a persistent foreign body, there is laying down of granulation tissue mainly by activation of the fibroblasts present in the wall of the ganglion. After initiating this process, the linen thread is removed on the 4th day. This finally leads to fibrosis which is complete by 8-10 days.

A similar technique was described in 1988 by Gang and Makhlouf (*6*). The technique used in our case has several advantages. No hospitalisation is needed and the problems of scar, hypertrophy and keloid formation are completely avoided. In contrast to Gang and Makhlouf[6] who used silk 2/0, we used linen. Linen is a natural twisted multifilament which is highly fibrogenic. This makes it one of the most suitable suture materials available for this purpose. Silk when removed leaves pigmentation in the dermis which is cosmetically undesirable to the fair skinned. Linen does not leave any lingering pigmentation.

An injection of local anesthetic was given at the time of the procedure along with a single dose of prophylactic oral antibiotic. The use of a long duration local anaesthetic (bupivacaine) reduced the need for post operative pain killers. We removed the thread on the 4th day as compared to 3 weeks by Gang and Makhlouf (*6*). This obviated the need for

repeated dressings and prevented complications arising out of infection. There were no infective complications in our series as compared to a 10% rate reported by Gang and Makhlouf. Furthermore, no recurrences were noted after a 2 year follow-up, compared to 5% by Gang and Makhlouf at the end of 6 months. Repeated outpatient appointments are avoided, thus lessening the inconvenience to the patient while at the same time achieving results comparable to other studies. Patients were able to return to work the following day after the procedure and average time lost from work was 2 days.

Our study involved 26 patients with a male/female ratio of 1/1, as compared to the western studies with a ratio of 1/3.1 (*18*). This could possibly be explained by the fact that in India the number of women seeking treatment for elective procedures is quite low due to poverty and ignorance. Other studies from the British and African population groups report a ratio of 1/1.4 (*13*) and 1/1.5 (*6*) respectively.

The mean age at the time of presentation was 25.3 years as compared to 40.25 years in the study by Paul and Sochart (*16*). Similarly the dominance ratio in our study was 1:1.4 which is quite opposite to that reported by Paul and Sochart (*16*). Pain was present in 61.5% of the ganglia in our case in contrast to the 33% reported by Gang and Makhlouf (*6*).

All studies more or less agree on the commonest position (i.e. dorsal midline) and on the time of presentation of patients.

CONCLUSION

The present study shows that ganglions of the wrist in India are most common in the age group 15-25 years with no sex predilection. Forty-six percent of the ganglia were seen in the dominant hand. The commonest presenting complaint was pain followed by cosmesis. The most common position was dorsal midline. One third of the patients presented within the first two months, especially when the swelling was associated with pain.

The use of our novel minimally invasive office surgical technique is capable of producing a mean resolution in ganglion size to the extent of 77.9% and half the patients show complete resolution of the swelling and associated symptomatology irrespective of their clinical profile. There are no recurrences and it is not associated with any local wound infection. The patient satisfaction for this procedure is high : 92.3%.

We conclude that our procedure is a safe, minimally invasive office technique which gives reliable and acceptable results. It is a useful technique as a first intervention in patients with simple ganglia. If surgical excision is limited to recurrences, the number of patients requiring surgery can be very small.

Acknowledgement

We thank Mr Birender Balain, Specialist Registrar in Trauma and Orthopaedics, West Midlands, United Kingdom, for his help with preparation and correction of the manuscript.

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