

## Original Research Article

# Double intra venous cannula versus single needle technique of aspiration and methylprednisolone injection in the treatment of wrist ganglion: a comparative study

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### ABSTRACT

**Background:** Ganglion is the one of the common soft tissue swellings in the hand and wrist. Treatment options available include reassurance, nonsurgical means like aspiration with or without steroid or hyaluronidase injection and surgical or arthroscopic excision. All current treatment options produce suboptimal results. This study endeavours to compare the outcome and recurrence rate and other complications after treatment of wrist ganglion by aspiration and methylprednisolone injection by double Intravenous cannula versus single needle technique.

**Methods:** A prospective comparative clinical study was done with a total of 72 patients. 36 patients in group 1 were treated with double intravenous cannula technique and 36 patients in group 2 were treated with single needle technique. All the patients were followed up for 6 months to look for recurrence and any complication. The patient's age, sex and various characteristics of the ganglion cyst like side, site, size, etc. were recorded.

**Results:** In group 1, recurrence was seen in 6 patients (15.7%) while in group 2, recurrence were seen in 14 (38.8%) patients. There was statistical significant difference between the two groups with p value of 0.04. No complication was seen in both groups due to methylprednisolone injection.

**Conclusions:** Inspired by the results we advise to use aspiration and methylprednisolone injection by double intravenous cannula technique in the treatment of wrist ganglion before any surgical intervention. It is safe, simple, cost effective method and is less invasive and less time consuming with recurrence rate comparable to surgical and arthroscopic interventions.

**Keywords:** Ganglion, Intravenous cannula, Aspiration, Methylprednisolone, Recurrence

### INTRODUCTION

Ganglion cysts are one of the most commonly encountered benign soft tissue swellings around the wrist. Ganglion is also one of the frequently seen lesions in minor surgical practice but still there is little agreement regarding their aetiology and management. Mostly these cysts are asymptomatic. The two main concerns bothering the patients are the cosmetic appearance of the

cysts and the apprehension regarding malignant transformation in future.<sup>1</sup> Ganglions actually are benign soft tissue lesions consisting of cyst that is filled with mucin. These cysts are in turn connected to a tendon, tendon sheath or joint capsule.<sup>2</sup> Wrist ganglia cysts usually develop as a result of fluid leak-out which is contained within the surrounding sheath of tendons around the wrist. It becomes a cystic structure that consists of fluid identical to the normal fluid found within

a joint or a tendon sheath. Location wise they are most commonly found over the dorsum of wrist overlying the scapholunate articulation, but may also involve the volar aspect of the wrist, tendon sheaths, and even interphalangeal joints.

Most commonly, these cysts arise from the distal portion of the dorsal aspect of the scapholunate interosseous ligament. It is suggested that the cysts arise at this specific location due to contact and stress over the distal scapholunate ligament between the joint and the capitate.<sup>3</sup> The classic clinical location of the dorsal carpal ganglion is over the scapholunate interval dorsally.

Incidence of ganglia is higher among females as compared to men. They may affect any age group; however they are most common between the 20s and 50s.<sup>4</sup> A history of trauma is elicited in at least 10% of the cases and is considered as a causative factor, although the pathogenesis is not clearly understood. Overall the incidence in males is 25/100,000 and females are 43/100,000.<sup>5</sup>

Symptoms of ganglion include pain with activity or palpation of the mass, decreased range of motion and decrease grip strength. Patients usually turns up for treatment only when these ganglions become associated with pain, grip strength weakness, interference with activities, and an increase in size.<sup>6</sup> Painless mass is the most common presenting complaint.<sup>7</sup> Pain, even when present, is more likely to be bothersome than debilitating. The clinical presentation is usually adequate for diagnosis, except in the case of occult wrist ganglion, where we use ultrasonography and magnetic resonance imaging for diagnosis.

Most of the patients coming for treatment wish to have some form of definitive treatment. However almost all the current treatment options available produce suboptimal results. Treatment can be either conservative or operative. The various treatment modalities for ganglion varies from mere assurance and observation to simple aspiration of cyst, aspiration and injection with or without methylprednisolone and/or hyaluronidase injection, transfixation using a silk suture, puncturing the cyst wall by a percutaneous needle or rupturing cyst wall manually or by percutaneously incising with tenotomy and radically excising the cyst using open or arthroscopic techniques.<sup>8</sup>

Unfortunately all of these procedures have high recurrence rates due to remnant tissues resulting from inadequate excision.<sup>9</sup> As non-operative treatments had comparatively lower complication rates, they can be used for symptomatic relief if the patients do not want surgery. Surgery has a lower recurrence rate than conservative treatment. However it has higher rates of complication and longer recovery period. It has been shown that surgical interventions do not provide better symptomatic relief compared to conservative treatment.<sup>1</sup>

Aspiration is usually performed with single needle. Firstly cyst fluid is aspirated and then steroid is injected into the cavity. The recurrence rate of this technique is relatively high as between 59%-68% for dorsal ganglion.<sup>10</sup>

A new technique using double intravenous cannula needle has shown a favourable result with lesser recurrence rate, comparable with recurrence rates of surgical and arthroscopic resections. In this technique, two intravenous cannulas are injected into the cystic cavity, and fluid is aspirated via distal cannula and methylprednisolone injected via the proximal cannula.

In this study, we compared the results of wrist ganglion aspiration and methylprednisolone injection with double intravenous cannula as a new technique in the treatment of wrist ganglion versus single needle technique.

## METHODS

**Materials used:** One intravenous cannula of 20 gauge, one intravenous cannula of 22 gauge, 10 ml and 2 ml disposable syringes, 18 gauge needle, injection methylprednisolone 1 ml (40 mg)

**Study design:** It is a prospective study.

**Study place:** Central Institute of Orthopaedics, VMMC and Safdarjung Hospital, New Delhi, conducted between April 2016 to October 2018. Total of 72 patients were included in this study.

### Selection criteria and procedure

Inclusion criteria were all patients of wrist ganglion; between the age group of 18-50 years; patients having symptomatic wrist ganglion at least 1 cm or more in size were included in the study.

Exclusion criteria were all recurrence cases were excluded; Ganglion associated with known pathological condition like local skin diseases, arthritis, immune-compromised conditions like HIV, type 2 diabetes mellitus etc.; patients who have received prior interventional treatment in any form for wrist ganglion.

All the patients were allocated in random order using block randomization with sealed envelope system to one of the two treatment regimens –aspiration and methylprednisolone injection by double intravenous cannula technique (Group 1) or single needle technique (Group 2).

Diagnosis was made on the basis of clinical examination except for the cases with doubtful diagnosis where ultrasonography was used to rule out other lesions. Patients with bilateral wrist ganglion were treated as two cases for the comparison of disease parameters. The various characteristics of the ganglion cyst like duration

of swelling, side involved, site, size, consistency, were recorded and pain, if any, present was assessed by Visual Analogue Scale score.

### Technique applied for group 1

**Double intravenous cannula aspiration technique:** Under all aseptic precautions, the cystic cavity was pricked by one of the intravenous cannula of size 20 Gauge at the distal part for aspiration of the cavity and at the proximal part of the cyst the other 22 gauge intra venous cannula was pricked to inject methylprednisolone into the cavity. Aspiration the cavity by intravenous cannula from the distal part, methylprednisolone injection via cannula pricked into the cystic cavity at the proximal part was maintained until all cystic fluid was aspirated out and white coloured methylprednisolone was seen coming out in the intravenous cannula placed distally.



**Figure 1: Double intravenous cannula aspiration technique.**

### Technique applied for group 2

**Single needle aspiration techniques:** Under all aseptic precautions, cystic fluid was aspirated with single 18 gauge needle and syringe. While keeping the needle in situ the syringe was detached from the needle and methylprednisolone was injected into the cavity through the same needle.

Compression bandage was applied in all the patients treated by aspiration and methylprednisolone injection by either of the two techniques. All the patients included in this study were followed up at 1 month, 3 month and 6 months to look for recurrences, any complication and assessment of pain by visual analogue scale score. Recurrences were assessed on clinical examination. Successful treatment was defined as disappearance of swelling at the final visit and recurrence was defined as reappearance of the swelling at any of the three follow up visits.



**Figure 2: Single needle aspiration techniques.**

### Statistical analysis

Categorical variables were presented in number and percentage (%) and continuous variables were presented as mean±SD and median. Normality of data was tested by Kolmogorov-Smirnov test. If the normality was rejected then non parametric test was used. Statistical tests were applied as follows-

- Quantitative variables were compared using Independent T test/Mann-Whitney Test (when the data sets were not normally distributed) between the two groups.
- Qualitative variables were correlated using Chi-Square test/Fischer exact test.

A p value of less than 0.05 was considered statistically significant.

The data was entered in MS Excel spread-sheet and analysis was done using statistical package for social sciences (SPSS) version 21.0.

### Ethical approval

The study protocol was approved by our Institute Ethics Committee. After obtaining an informed and written consent, both the groups were evaluated and compared on the various parameters as per clinical proforma.

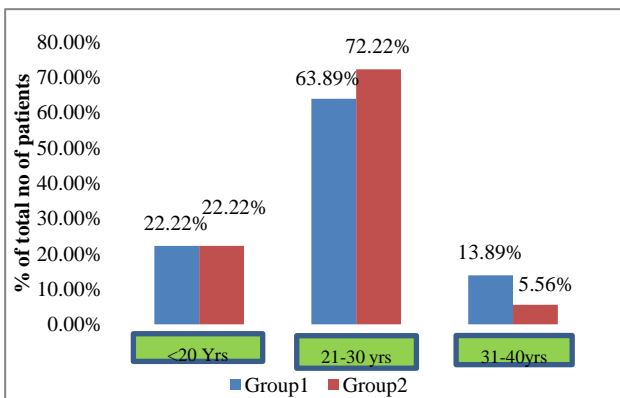
### RESULTS

A total of 72 patients were included in the study and followed up for 6 months. In this study the age of the patients ranged from 18-38 years with 68% falling in the age group 21-30 years. There were 48 females (66.6%) and 24 males (33.3%) in the study 19% patients had complaint of pain and 13% patients had history of trauma. 65% patients had involvement on dorsal side with 35% patients on volar side of wrist. In group 1, recurrence was seen in 6 patients (15.7%) out of which 2 patients had recurrence at 1 month, 3 patients had

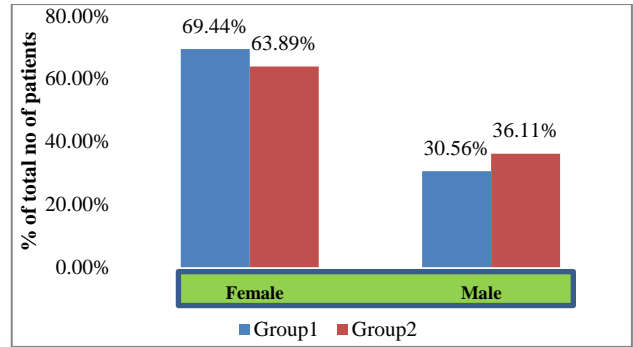
recurrence at 3 months and 1 patient at follow up visit at 6 month. In group 2, recurrence was seen in 14 (38.8%) patients. There was statistically significant difference between the two groups with p value of 0.04. Thus aspiration and methylprednisolone injection by double intravenous cannula technique had a lower recurrence rate of 15.7% as compared to single needle technique in the treatment of wrist ganglion and thus can be used before any surgical intervention. Apart from recurrence in each group, no other complication was seen in any of the patients in both the groups due to methylprednisolone injection.

**Table 1: Baseline characteristics of study population.**

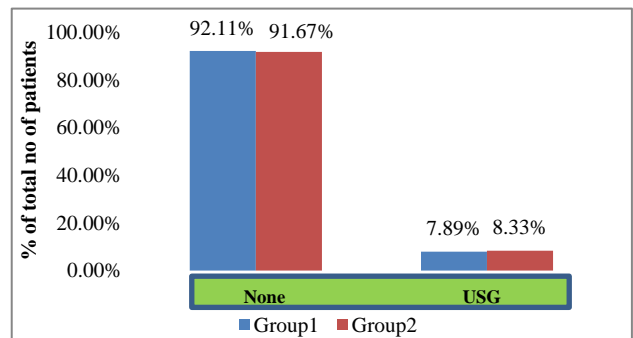
Parametres	Ranges and variables	Total No. and Percentage
		N (%)
Age (in years)	20	16 (22.2)
	21-30	49 (68)
	31-40	7 (9.8) with mean age of around 24 years
Sex	Male	24 (33.3)
	Female	48 (66.6)
Side of involved wrist	Dorsal	48 (65)
	Ventral	26 (35)
Involvement of dominant/ non dominant side	Dominant side	47 (65.3)
	Non dominant side	25 (34.7)
Complaint of pain	Present	14 (19)
	Absent	60 (81)
History of trauma	Present	10 (13.5)
	Absent	64 (86.4)
Recurrences	Group 1 (Double intravenous cannula technique)	6 (15.7)
	Group 2 (Single needle technique)	14 (38.8)



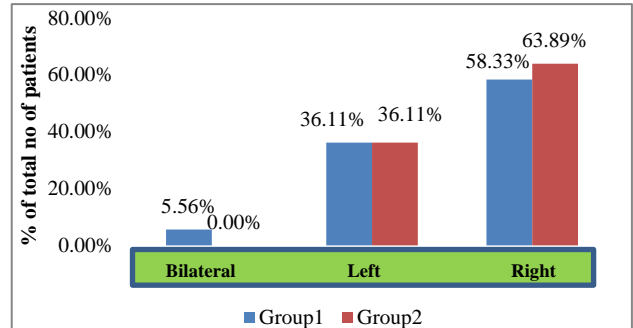
**Figure 3: Age group composition of the two groups receiving treatment using two different techniques.**



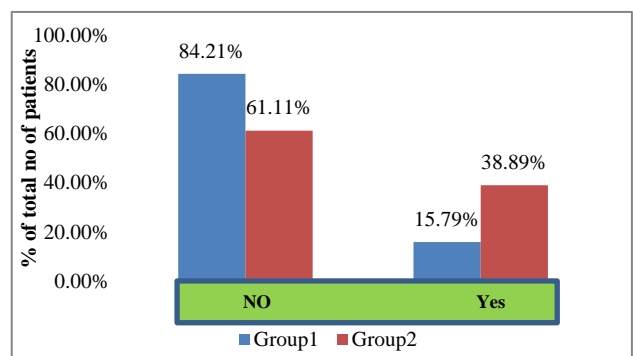
**Figure 4: Sex distribution of two groups receiving treatment using two different techniques.**



**Figure 5: Ultrasonography investigation required for confirmation of diagnosis in the two groups.**



**Figure 6: Side involvement in two groups.**



**Figure 7: Comparison of rate of recurrences in two groups.**



## DISCUSSION

Ganglion cysts are most common benign soft tissue swellings around the wrist. The variety of treatment modalities employed speaks of the fact that we still know very little about the inciting aetiology, the pathogenesis, natural history and response to treatment of ganglion. Ganglion has been treated by a variety of non-operative or operative methods. Because of benign course and spontaneous resolution in up to 50% of these patients, non-surgical modes of treatment including simple observation, finger pressure, aspiration, aspiration and injection of steroid, hyaluronidase, or sclerosant are advised initially for this lesion.<sup>11</sup> Operative methods mainly include open surgical and arthroscopic excision of the ganglion cyst. Among non-operative techniques, aspiration with or without intralesional steroid injection have been widely used. Recurrence is the most common complication of treatment of ganglion.

In our study, we achieved better results with aspiration and injection of methylprednisolone acetate in treatment of wrist ganglion with double intravenous cannula as compared to single needle technique in patients with wrist ganglion. In follow-up period of this new aspiration technique with double intravenous cannula, no complication, low recurrence rate and decreased need for surgical intervention were observed.

The recurrence rates of surgical and arthroscopic interventions for ganglion treatment are reported between 14-28% in the literature.<sup>12</sup> In the previous studies, recurrence rates for simple aspiration and aspiration plus steroid injection therapies are 59-68% and 40% respectively.<sup>10,13</sup>

Injection therapy with double intravenous cannula reported the advantages in the form of relatively low recurrence, no scar, simple outpatient treatment which can be readily given by junior doctor, without any risk to neighbouring tendons and other neurovascular structures, no worsening of the appearance even if the injection fails to cure.<sup>14</sup>

In this study we determined the recurrence rate of 15.7% for the new technique of aspiration and methylprednisolone injection with double intravenous cannula needle in the treatment of wrist ganglion as compared recurrence rate of 38.8% in patients treated with single needle technique.

These results in terms of recurrence rate in this study are comparable with two other studies. Korkmaz et al evaluated the method of aspiration and injection of methylprednisolone acetate into the cavity by double intravenous cannula needle as a new technique and determined the recurrence rate of 15.8% for the new technique.<sup>15</sup> Sharma et al concluded that the new technique of aspiration and methylprednisolone injection into the cavity by intravenous cannula needle had a lower

recurrence rate of 18.75% in comparison to sharp pointed needle and did not detect any complication related to methylprednisolone injection.<sup>8</sup> Even this low recurrence rate in this study is also comparable with the recurrence rates of surgical and arthroscopic interventions.

The use of intravenous cannulas allows direct access into the ganglion cavity. After observing the gelatinous fluid coming out from the intravenous cannula, sharp-pointed needle part is retracted and only the plastic part is left inside the ganglion. Therefore complications related to structures in the vicinity of the lesion are less encountered and the procedure becomes less painful after the initial prick as the pointed needle part of the intravenous cannula is withdrawn. The two reasons for the low recurrence rates seen in double Intravenous cannula technique is complete aspiration of the gelatinous fluid until the white coloured methylprednisolone was seen in syringe and the second the use of methylprednisolone injection.

## CONCLUSION

It has been found that double intravenous cannula technique as compared to single needle techniques is having lesser recurrence rates and it should be used before any surgical intervention in the treatment of wrist ganglion as it is very simple, less invasive, less time consuming, safer and cost effective method as compared to open surgical and arthroscopic methods..

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*Ethical approval: The study was approved by the institutional ethics committee*

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