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Surgical results of different interventions in open surgery for wrist dorsal ganglion cyst

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Abstract

Aim: A ganglion cyst is the most common benign mass on the wrist. They are frequently seen on the dorsal aspect of the wrist. These lesions, which show symptoms such as pain and limitation of movement, can become restrictive in daily life activities. Surgical methods are accepted as the gold standard in treating this lesion, with a wide range of treatment options. In our study, two new surgical methods were described for the open resection of wrist dorsal ganglion cysts, which were not previously described in the literature. Three surgical methods were compared in open surgery for wrist dorsal ganglion cysts.

Materials and Methods: Our study divided 180 patients with three different surgical methods into three groups. The functional results of the patients were evaluated with VAS and DASH scores at the 1st, 3rd, 6th, and 12th months. Comparisons were made in terms of developing complications and recurrence rates.

Results: As a result of the evaluation, it was found that the functional outcomes, recurrence, and complication rates of all three surgical methods were similar.

Conclusion: Considering that the results of 2 different surgical methods not described before are similar to those in the literature, the surgical techniques we described can be safely used in wrist dorsal ganglion cyst surgery.

Introduction

Ganglion cysts are the most common benign space-occupying lesion on the wrist [1]. These masses, usually located volar or dorsal in the wrist, may present with symptoms such as pain, swelling, and limitation of movement. Physical examination and imaging methods such as USG and MRI are used in the diagnosis. Many treatment methods have been described in the literature. We can examine these in 2 groups' surgical and non-surgical treatment methods. Although the complication rate of non-surgical procedures is relatively lower, the recurrence rate is higher [2]. A wide range of complications, such as postoperative hematoma formation, infection, neuroma, scapholunate instability, hypertrophic scarring, and neuropraxia, can be seen in surgical procedures [3]. In our study, two new surgical methods were described in the open resection of wrist dorsal ganglion cysts, which were not previously described in the literature. The functional results, complications, and recurrence rates of 3 different surgical methods used in open surgery of wrist dorsal ganglion cyst were compared.

Materials and Methods

The study was carried out with the permission of Adana City Training and Research Hospital, Clinical Ethics Committee (Decision No: 2435). This study was performed in compliance with the Declaration of Helsinki. Because the study was designed retrospectively, no written informed consent form was obtained from patients. In our retrospective study, patients operated on by a single surgeon for a dorsal ganglion cyst on the wrist between 2017 and 2021 and with a follow-up period of at least 12 months were included. Patients under the age of 18, with missing or conflicting data in the patient file, with connective tissue diseases (such as Ehler-Danlos), rheumatological diseases, wrist deformity, a history of fracture in the wrist bones, a history of wrist instability or ligament injury, who were operated on for any reason on the wrist, who had previously applied invasive treatment methods (such as aspiration, excision, injection) for ganglion cysts, whose postoperative pathology results could not be definitively said to

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have ganglion cysts and those who cannot be followed up patients were excluded.

Surgical method

Three different surgical methods were applied to patients with ganglion cysts on the dorsal aspect of the wrist. As standard in all three methods, It was performed with a transverse incision over the radiocarpal joint under a tourniquet, general anesthesia, or with a peripheral block. The extensor tendons were retracted to expose the ganglion. The following process progressed differently in each group of patients. In common, it was aimed to remove the ganglion cyst as a whole in all three groups. At the end of the operation, bleeding control was ensured, and the layers were sutured by their anatomy. After dressing, it was wrapped with an elastic bandage. In the postoperative period, the wrists of the patients were mobilized early, and their movements were released.

Group 1 patients were treated with the surgical method defined by Angelides et al. [4] in 1976 and still accepted as the most effective method [5]. In this method, the ganglion cyst with its pedicle is visible up to the joint capsule. As described in the literature, the cyst with a part of the joint capsule was excised entirely as a single block. After excision, the articular surface of the radius, the scapholunate ligament, and the capitatum may become visible. Unlike Group 2 patients, a part of the joint capsule was not removed. The pedicle was cut from the point closest to the joint capsule between the joint capsule and the ganglion cyst, and that area was cauterized with cautery. The joint capsule is left intact. A part of the joint capsule was not removed in group 3 patients, similar to group 2. The pedicle was cut between the joint capsule and the ganglion cyst at the closest point to the capsule and sutured with a 4-0 vicryl suture. The excised specimens in all three groups were sent to the pathology laboratory for analysis.

Postoperative protocol

All patients were followed up with an elastic bandage after the operation. Active and passive range of motion exercises were started 5 to 7 days after the operation. The sutures of the patients were removed on the 14th day. In the subsequent follow-ups, the patients were followed up at 1,3, 6 and 12 months by phone call.

Outcome measures

A visual Analog Scale (VAS) score measures pain intensity. The patient gives a value between 0 and 10 for their pain. 0 means no pain, and 10 represents the most severe pain. The Disability of Arm, Shoulder, and Hand (DASH) score evaluates upper extremity functions [6]. It contains 30 questions about the difficulties individuals face in daily life, pain, and activity restrictions. A score between 0-100 is made according to the answers given. 0 means no restriction, and 100 means maximum restriction.

Statistical analysis

Statistical analysis were performed using the Statistical Package of the Social Sciences (IBM SPSS 28.0.1.0; Corp., Armonk, NY, USA). The variables were investigated using visual (histograms, probability plots) and analytical methods (Kolmogorov-Simirnov/Shapiro-Wilk's test) to determine whether or not they are normally distributed. Descriptive analyses were presented using medians and interquartile range (IQR) for the non-normally distributed variables. The Chi-square test or Fisher's exact test was used to compare proportions in different groups. The Kruskal-Wallis test was used as a non-parametric alternative to one-way ANOVA to compare the median ranks of three or more independent groups. These tests were chosen within the framework of the general rules in statistics, depending on the characteristics of the dependent and independent variables. The significance level was set at $p<0.05$. Our study performed a power analysis to determine the sample size. G*Power Version 3.1.9.6 (Heinrich-Heine-Universität Düsseldorf, Düsseldorf, Germany) was used. When the effect size was determined as 0.25, and the β/α ratio as 1, the power of the study was determined as 0.908 in the evaluation made on 180 patients.

Results

Considering the inclusion and exclusion criteria of the study, the data of 217 patients were reached. One hundred eighty patients, 60 in each group, were included in the study by computer-assisted randomization (www.randomizer.org). The diagnosis of ganglion cyst was supported by MRI in all operated patients for this rea-

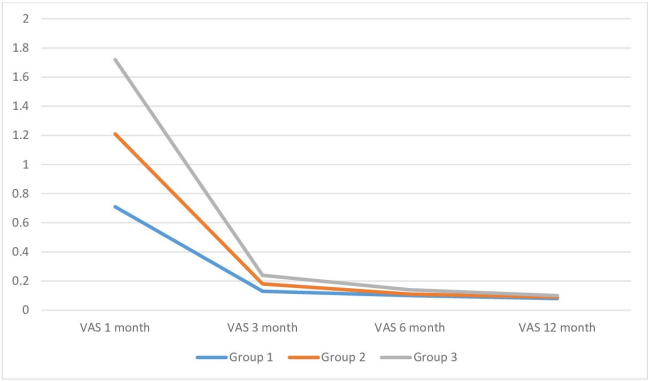

Figure 1. Variation of patients' VAS score averages over time.

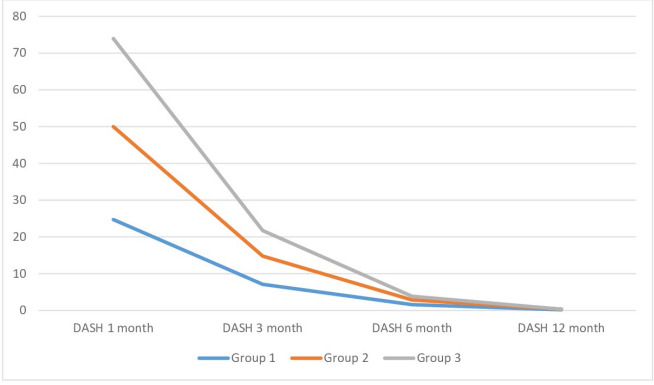

Figure 2. Variation of patients' DASH score averages over time.

Table 1. Demographic characteristics of patients.

	Group-1 Patients	Group-2 Patients	Group-3 Patients	P value
Gender(male/female)	27/33	24/36	26/34	0.853
Age	41 (14.5)	40 (13.5)	36.5 (12.75)	0.195
Dominant (Right/Left)	58/2	56/4	53/7	0.059
Side (Right/Left)	39/21	36/24	32/28	0.426
Complication	6.7%	3.3%	5.1%	0.643
Recurrence	8.3%	13.3%	11.7%	0.675
Follow-up (months)	40.5 (26)	39 (25)	34.5 (26.75)	0.198

Table 2. VAS and DASH score values of the patients.

	Group-1 Patients*	Group-2 Patients*	Group-3 Patients*	P value
VAS 1 Month	1(1)	0(1)	0(1)	0.509
VAS 3 Month	0(0)	0(0)	0(0)	0.438
VAS 6 Month	0(0)	0(0)	0(0)	0.180
VAS 12 Month	0(0)	0(0)	0(0)	0.210
DASH 1 Month	26.25(11.40)	29.2(13.30)	26.25 (14.10)	0.456
DASH 3 Month	6.7 (7.90)	7.5(4.20)	7.5(5.0)	0.631
DASH 6 Month	0 (2.5)	0(1.70)	0(1.48)	0.435
DASH 12 Month	0(0)	0(0)	0(0)	0.147

*Median (Interquartile range) values.

son. The patient's demographic characteristics and the disease data are shown in Table 1. VAS and DASH scores of the patients are given in Table 2, Figure 1, and Figure 2. Hematoma occurred in two of the group-1 patients in the postoperative period. Persistent paresthesia at the incision site developed in 1 patient, and an infection developed in 1 patient in the early postoperative period. In Group 2 (cautery) patients, 1 had an infection in the early postoperative period, and 1 had permanent paresthesia in the incision area. In Group 3 patients, 1 had an infection in the early postoperative period, 1 had paresthesia at the incision site, and 1 had a hypertrophic scar at the incision site.

No statistically significant difference was found when all three groups were compared regarding complications and recurrence, VAS, and DASH scores.

Discussion

A ganglion cyst is one of the body's most common benign soft tissue tumors [7]. In the surgical treatment of ganglion cysts on the dorsal aspect of the wrist, the method classically described in the literature has been recommended to be removed together with a part of the joint capsule [4, 5, 8]. In this method, the risk of developing scapholunate instability is mentioned. This is an undesirable complication [9-11]. In addition, if the wrist ganglion has a long stalk, a wide or a second incision may be needed [4]. In our study, different from the literature, two surgical methods were defined and applied. These three methods showed similar results regarding recurrence, complication rates, and functional outcomes. They are safe surgical procedures for surgeons who do not want to face undesirable complications such as scapholunate instability. In addition, it does not require a second incision can be considered an advantage of these methods.

Ganglion cysts are masses that present with swelling, pain and limitation of movement in the wrist. In the literature, various treatment methods have been described, such as open surgical excision, arthroscopic surgical excision, aspiration with or without corticosteroid, observation/reassurance, aspiration plus multiple punctures with or without immobilization, aspiration plus electrocautery, aspiration plus fixation, aspiration plus ethanol injection, aspiration plus tetradecyl sulfate, and double dart technique [12]. We can examine these treatments in 2 groups surgical and non-surgical methods. High recurrence rates in non-surgical treatment methods have made surgical treatments the gold standard [8, 13, 14].

Open and arthroscopic surgical methods are used to treat ganglion cysts. When we look at the literature, we see that it has similar results [15, 16]. Reduced recovery time, having smaller incisions and less aesthetic discomfort due to this, and allowing the treatment of different intra-articular pathology in the wrist can be counted among the advantages of arthroscopic surgical treatment [1]. However, the steep learning curve, the need for specialized instrumentation, and the long surgery time can be counted among the disadvantages of open surgery [15]. Open surgery remains popular in treating ganglion cysts despite the increasing use of the arthroscopic method. A recurrence rate of 4% to 40% has been reported in the literature on this classical surgical method [17]. Several hypotheses about this recurrence rate vary in publications and lack of consensus in the literature. It has been stated that hand surgery specialty training, knowledge and skill of the surgeon in regional anatomy, and professional experience may be responsible for this situation [18]. Consistent with the literature in our study, recurrence was observed at a rate of 11.1% when all of the cases were considered. No significant difference was found in recurrence when the three-surgery groups were

evaluated. There was no superiority of these three methods over each other regarding recurrence.

Many different complications have been described after ganglion cyst surgery. Wound infection, radial artery injury, neuropraxia, hypertrophic scar, scapholunate dissociation, neuroma, and median nerve damage are among the most common complications [5, 12]. These complication rates have been reported to range from 0% to 56% [5, 19-23]. Keloid formation can be seen as cosmetically disturbing after open surgical procedures. In addition, if proper dissection is not performed in ganglion cyst surgery, neuroma formation originating from both radial and ulnar dorsal sensory nerves may occur [24]. Considering all of our study's surgery patients, our complication rate was 5%.

Most ganglion cysts on the dorsal aspect of the wrist are associated with the scapholunate ligament [8]. In the surgical method described by Angelides et al. in 1976, it was recommended to remove the entire ganglion, pedicle, part of the cyst associated with the scapholunate ligament, and the associated joint capsule [4]. This method, developed to reduce recurrence rates, brought some complications specific to this surgery. Cases of scapholunate instability after ganglion cyst surgery have been reported in the literature [25-27]. This is thought to be due to the weakening of the scapholunate ligament. The literature shows a relationship between scapholunate instability and dorsal ganglion open surgery, as described by Angelides et al. [4]. In our study, scapholunate instability was not detected in all three groups. Considering the cases with instability in the literature, the surgical procedures applied in group 2 and group 3 described in our study are safe in this respect. This is because a part of the joint capsule is not excised in the surgical procedures we have described. There is also no risk of interference with the dorsal part of the scapholunate ligament. In addition, similar results were obtained in all three groups regarding pain and functional results at the 1st-3rd-6th and 12th months after surgery. However, long-term follow-up results should be observed in large patient groups to reach a definitive conclusion.

There are certain limitations of our study. The limitation of our study is the follow-up period is limited to 1 year in some patients. Retrospective study design, single-center study, and limited numbers are other limitations of the current study. The same surgeon performed all of the surgical methods. The same standard procedures were applied in preoperative, perioperative, and postoperative patient-related interventions. This reduced the number of variables that could affect the results when comparing three surgical methods.

Conclusion

Undesirable complications may occur after ganglion cyst surgery. Scapholunate instability is one of these unwanted complications. In selected cases, the surgical methods we describe can be applied in group 2 and group 3 patients to avoid the risk of single or small incisions and scapholunate instability. In addition, complications and recurrence rates in patients who underwent these new surgical methods, which were not previously described in the literature, were similar to those in patients who underwent open surgery for wrist dorsal ganglion cysts described in the literature. The surgical methods we described can safely be used in wrist dorsal ganglion cyst surgery.

Availability of data and materials

The datasets used and analyzed during the current study are available from the corresponding author on reasonable request.

Ethical approval

The study was carried out with the permission of Adana City Training and Research Hospital, Clinical Ethics Committee (Decision No: 2435).

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