Treatment of Wrist Dorsal Synovial Cyst with Percutaneous Sclerotherapy Using Hypertonic Saline Solution

Tratamento de cisto sinovial dorsal do punho com escleroterapia percutânea utilizando solução salina hipertônica

Murilo Gobetti[1] João Baptista Gomes dos Santos[1] Fernando Araujo Pires[1]
Luis Renato Nakachima[1] João Carlos Belloti[1] Flavio Faloppa[2]

[1] Discipline of Hand Surgery and Senior Member of the Department of Orthopedics and Traumatology, Escola Paulista de Medicina da Universidade Federal de São Paulo, SP, Brazil
[2] Department of Orthopedics and Traumatology, Escola Paulista de Medicina da Universidade Federal de São Paulo, São Paulo, SP, Brazil

Address for correspondence Fernando Araujo Pires, Discipline of Hand surgery and Upper Limb, Rua Borges Lagoa 786, Vila Clementino, São Paulo, SP 04038-001, Brazil (e-mail: drfernandoapires@gmail.com).

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Abstract

Objective To evaluate the efficacy of hypertonic saline infiltration as a sclerosing agent in the dorsal synovial cyst of the wrist.

Method Patients of both genders, aged 18 years or older, with clinical and ultrasound diagnosis of synovial cyst, and without any previous treatment were selected. Case series in which 50 patients underwent aspiration of the contents of the cyst and infiltration of the hypertonic saline solution (2 ml sodium chloride solution 20% and 1 ml of lidocaine 2%). The patients were followed up for 24 weeks, when the parameters pain, strength, range of motion, function (quickDASH and Brief Michigan question), recurrence, and complications were evaluated.

Results A total of 46 patients were evaluated for 24 weeks, 18 (39.1%) cysts evolved to resolution, and 28 (60.9%) presented recurrence. There was no statistically significant difference in the effect force or in the range of motion. There was no clinically significant difference in the scores of the questionnaires. The most frequent complications were pain and edema.

Conclusion Infiltration with hypertonic saline solution for the treatment of dorsal synovial cyst of the wrist showed a recurrence rate of 60.9%.

Keywords
- sclerotherapy
- synovial cyst
- serum
- conservative treatment

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Resumo

Objetivo Avaliar a eficácia da infiltração da solução salina hipertônica como agente esclerosante no cisto sinovial dorsal do punho.

Método Pacientes de ambos os sexos, com 18 anos ou mais, com diagnóstico clínico e ultrassonográfico de cisto sinovial, e sem nenhum tratamento prévio foram selecionados. Série de casos em que 50 pacientes foram submetidos a aspiração do conteúdo do cisto e infiltração da solução salina hipertônica (2 ml solução de cloreto de sódio 20% e 1 ml de lidocaína 2%). Seguimento realizado por 24 semanas, durante as quais foram avaliados os parâmetros dor, força, arco de movimento, função (questionários quick disabilities of the arm, hand, and shoulder [quickDASH] e brief Michigan), recorrência e complicações.

Resultado Foram avaliados 46 pacientes por 24 semanas, 18 (39,1%) cistos evoluíram para cura e 28 (60,9%) cistos apresentaram recorrência. Não houve diferença estatisticamente significante nos quesitos força e arco de movimento. Não houve diferença clinicamente significante nos escores dos questionários. As complicações mais frequentes foram dor e edema.

Conclusão A infiltração com solução salina hipertônica para tratamento do cisto sinovial dorsal do punho mostrou taxa de recorrência de 60,9%.

Palavras-chave

- escleroterapia
- cisto sinovial
- soro
- tratamento conservador

Introduction

Synovial cyst is the most common soft-tissue tumor of the wrist and hand.[1] It is found in patients of all ages, with peak incidence in the age group between second and fourth decade of life and predominantly in females.[2,3] The back of the wrist is the most common site of cyst appearance, with 60 to 70% of all wrist and hand cysts.[3]

There are numerous forms of treatment for dorsal cyst described in the literature: observational; puncture and aspiration of the contents of the cyst with or without corticosteroid infiltration; infiltration of sclerosing agents; transcutaneous electrocautery; and surgical (open or arthroscopic).[4]

The non-surgical treatment by aspiration with or without infiltration has a low-resolution rate (20–30%) compared to surgical treatment, which presents 90 to 100% resolution; however, the surgical treatment is subject to complications inherent to surgery.[4]

Sclerosing agents are a valid option, and for a sclerosing agent to be considered ideal, it must be able to produce cyst obliteration and not cause complications.[5]

Sclerotherapy with hypertonic saline has been performed for decades, for example in the treatment of telangiectasias and reticular veins;[6] symptomatic simple abdominal cysts[7]; and, in synovial cysts.[8]

In 2003, Dogo et al.[8] performed a series of cases of synovial cysts treated with hypertonic saline infiltrations and presented a resolution rate of 100%, with only mild pain as a complication. The treatment of this very prevalent pathology with this procedure with high resolution rate and low morbidity could be the treatment of choice, but there is still lack of evidence in the subject in the literature.[1,3,8]

There is a need to test the real efficacy of hypertonic saline in the treatment of dorsal synovial cyst, since it can be easily implemented in clinical practice, with low incidence of complications and high-resolution rates.

The aim of the present study is to evaluate the reproducibility of the method by analyzing the resolution rate, recurrence, and possible complications with the conservative treatment of the dorsal synovial cyst of the wrist through aspiration and infiltration of hypertonic sodium chloride solution 20% diluted with lidocaine 2%, in a ratio of 2:1 ml.

Patients and Methods

The present study is a case series, prospective, longitudinal, interventionist, approved by the institutional ethics and research committee, conducted in a university hospital.

Patients older than 18 years of age with dorsal synovial wrist cyst with a diagnosis confirmed by ultrasound were included. Patients with a non-visible cyst with a neutral wrist, other concomitant pathologies affecting the hand or wrist, patients with a history of any type of previous treatment as well as those who refused to sign the informed consent were excluded.

Before the procedure, epidemiological data such as age, gender, affected side, and previous history of trauma were collected. The intensity of wrist pain was also evaluated by the visual analog scale (VAS);[9] the wrist range of motion (goniometry); grip strength (mean Jamar dynamometer);[10] and function of the hand and upper limb through questionnaires (quick disabilities of the arm, shoulder, and hand [QuickDash] and Brief Michigan Hand questionnaire)[11,12]

There were five moments of patients' evaluation: before the procedure and at 4, 8, 12, and 24 weeks.

The puncture was performed by the single dart technique.[13] Local anesthesia was performed (injection of 1 ml

Table 1 Result at 4 weeks and 24 weeks

Order	4 weeks	New procedure	24 weeks	Order	4 weeks	New procedure	24 weeks
1	PNV	Yes	PV	26	HEALING	No	HEALING
2	PV	Yes	PV	27	HEALING	No	PNV
3	PV	Yes	PV	28	HEALING	No	PNV
4	PV	Yes	PV	29	PNV	Yes	HEALING
5	PV	Yes	HEALING	30	HEALING	No	PV
6	HEALING	No	HEALING	31	PNV	Yes	PNV
7	PNV	Yes	HEALING	32	LOST TO FOLLOW-UP		
8	PV	Yes	HEALING	33	PNV	Yes	PNV
9	HEALING	No	PV	34	PNV	Yes	PNV
10	HEALING	No	HEALING	35	HEALING	No	PNV
11	PV	Yes	PV	36	HEALING	No	PNV
12	PNV	Yes	HEALING	37	HEALING	No	HEALING
13	PNV	Yes	PNV	38	HEALING	No	HEALING
14	HEALING	No	PV	39	PV	Yes	HEALING
15	PV	Yes	PNV	40	HEALING	No	HEALING
16	PV	Yes	PV	41	HEALING	No	PV
17	PNV	Yes	PNV	42	HEALING	No	PV
18	PNV	Yes	HEALING	43	HEALING	No	HEALING
19	HEALING	No	PNV	44	LOST TO FOLLOW-UP		
20	PV	Yes	PV	45	PV	Yes	HEALING
21	LOST FOLLOW-UP			46	HEALING	No	HEALING
22	PV	Yes	PV	47	LOST TO FOLLOW-UP		
23	PNV	Yes	PNV	48	PNV	Yes	PV
24	HEALING	No	HEALING	49	HEALING	No	PV
25	PNV	Yes	PNV	50	HEALING	No	HEALING

Abbreviations: PNV, palpable and non-visible; PV, palpable and visible.

of lidocaine 2% in the subcutaneous region in the proximal region to the cyst), after which the cyst was punctured with a 40×12 needle, its contents were aspirated, and a 20% hypertonic sodium chloride and 2% lidocaine (2:1) solution was infiltrated. Paracetamol was prescribed as analgesic medication if there was pain.

At 4 weeks, pain or paresthesia, hyperemia, and edema in the cyst region were evaluated. According to the evolution of the cyst, the patients were divided into t groups: group 1 (resolution), which included individuals in whom cysts are no longer possible to be palpated; group 2 included individuals in whom the cyst is palpable but not visible with the wrist in a neutral position; group 3 included patients in whom the cyst was visible with the wrist in a neutral position. On this occasion (4 weeks), a new puncture was performed in patients in groups 2 and 3, by the same technique.

At 8, 12, and 24 weeks, the patients were reclassified. It was also recorded whether there were complications such as pain, edema, hyperemia, paresthesia, or skin necrosis or not.

At 24 weeks, the patients underwent an evaluation similar to that performed preprocedure (pain, wrist goniometry, grip strength, and functional questionnaires).

Statistical method

The statistical methods used were the Student paired t-test and two-proportion equality test, with significance level < 0.05.

Results

Between July 2018 and November 2019, we treated 50 synovial cysts from 50 patients. In the 24 weeks of follow-up, 4 patients were lost to follow-up, totaling 46 patients at the end of the study (►**Table 1**). The mean age was 36.2 years (18 to 68). The majority of the patients were female (73.9%), and the right side was the most affected (52.2%). Only 8.7% mentioned some type of trauma to the wrist before the cyst.

Table 1 Distribution of results in weeks

Result	Week 0		Week 4		Week 24	
	N	%	N	%	N	%
Healing	0	0.0%	21	45.7%	18	39.1%
Not visible	0	0.0%	13	28.3%	13	28.3%
Visible and palpable	46	100%	12	26.1%	15	32.6%

Table 2 Scores before and 24 weeks after procedure

Scores		N	Average	Standard deviation	*P*-value
VAS	Pre	46	4.36	2.94	0.006
	Post	46	2.86	3.41	
Quick DASH	Pre	46	26.15	21.06	< 0.001
	Post	46	15.37	18.57	
Brief Michigan	Pre	46	70.57	18.09	< 0.001
	Post	46	83.17	15.06	

Abbreviations: DASH, disabilities of the arm, shoulder, and hand; VAS, visual analog scale.

After the 1st infiltration, with 4 weeks of follow-up, there was 45.7% resolution; 28.3% remained palpable, and 26.1% were visible and palpable. A second infiltration was performed in the palpable cysts.

At 24 weeks of follow-up, of those who underwent only one infiltration (total of 21 patients), 10 (21.7%) progressed to resolution, 5 (10.9%) were in group 2, and 6 (13.0%) were group 3. Of those who underwent two infiltrations, 8 evolved to resolution, 8 remained palpable and 9 were palpable and visible.

Adding the 2 groups, after 24 weeks of follow-up, 18 (39.1%) cysts evolved to resolution, and 28 (60.9%) cysts presented persistence. Of the cysts that persisted, 13 (28.2%) cysts were palpable and not visible, and 15 (32.6%) were palpable and visible (►**Table 1**).

Measuring pain intensity through the VAS scale before and after treatment, a statistically significant improvement in pain was noticed (►**Table 2**). When we evaluated the groups, we observed an improvement in most (77.7%) of the healed patients, in almost half (46.1%) of the patients with palpable cyst, and only in 26.6% of the patients with palpable and visible cyst.

The measurements of grip strength and range of motion pre-procedure and after 24 weeks of follow-up did not present statistical differences (►**Table 3**).

The mean scores of the QuickDASH pretreatment questionnaire and at the end of 24 weeks of follow-up were 26.15 and 15.37, respectively (►**Table 2**).

The mean scores of the pre-treatment Brief Michigan Hand Questionnaire and after 24 weeks of follow-up were 70.57 and 83.17, respectively (►**Table 2**).

The complications observed were pain (73.9%), and 58.8% used analgesics; edema (91.3%); hyperemia (37%); and paresthesia in the infiltration region (30.4%). There were no cases of necrosis. No patient needed additional procedure to treat these complications (►**Table 4**).

Table 3 Result of the range of motion (degrees) and grip strength (kgf) before and 24 weeks after the procedure

Direct fist		Average	*P*-value
Inflection	Pre	71.93	0.847
	Post	72.20	
Extension	Pre	65.17	0.109
	Post	66.78	
Ulnar bypass	Pre	35.09	0.212
	Post	33.70	
Radial deviation	Pre	22.48	0.133
	Post	20.87	
Grip force	Pre	28.29	0.055
	Post	25.78	

Table 4 Immediate post infiltration complications

		Week 4		Week 24		*P*-value
		N	%	N	%	
Pain	No	12	26.1%	34	73.9%	< 0.001
	Yes	34	73.9%	12	26.1%	
Painkiller	No	14	41.2%	46	100%	< 0.001
	Yes	20	58.8%	0	0.0%	
Edema	No	4	8.7%	46	100%	< 0.001
	Yes	42	91.3%	0	0.0%	
Hyperemia	No	29	63.0%	46	100%	< 0.001
	Yes	17	37.0%	0	0.0%	
Necrosis	No	46	100%	46	100%	- x -
	Yes	0	0.0%	0	0.0%	
Paresthesia	No	32	69.6%	43	93.5%	0.003
	Yes	14	30.4%	3	6.5%	

Discussion

There were 4 losses to follow-up, an acceptable number in the literature.[14] We followed 46 patients; a number comparable to other previous studies related to the theme.[15]

Regarding epidemiological characteristics such as gender, age, and affected side, we found characteristics similar to other articles in the literature.[2,8]

The diagnosis of the dorsal cyst was made by clinical examination and confirmed by ultrasound examination, as well as in previous studies.[16]

The method of performing the procedure called single dart was chosen because it increases the chances of the substance being infiltrated within the cyst, besides causing fewer complications.[13]

Follow-up was 24 weeks after initial infiltration, also similar to previous studies.[13]

Regarding the treatment options described in the literature, the expectant management of the cyst presents spontaneous resolution in an average of 49% of cases, in a follow-up of 2 to 12 years.[3] Simple aspiration presents great variation in recurrence rate, with a mean recurrence of 41%.[3] Aspiration and infiltration with corticosteroids have variable recurrence rates of 14 to 83%, which may lead to hypopigmentation of the skin.[3,17]

Hyperosmotic sclerosing agents and sclerosing detergents, such as polidocanol and tetradecyl sodium sulfate, are the safest and most effectively used for medical procedures but with similar resolution rates.[3,5,13]

Using hypertonic sodium chloride solution in aspiration and sclerotherapy of the cyst, Dogo et al.[8] reported no recurrence of the synovial cyst. Considering the recurrence of the palpable cyst, regardless of whether it was visible or not, in our study there was recurrence of 60.9% of the cysts within 24 weeks of follow-up. If we consider only visible cysts as recurrence, we reduce this rate to 32.5%. With this difference in values, it is possible to observe that this data (definition of resolution), not equalized in the studies, may explain the divergence in the results.

This difference in the observed results can also be explained by the difference in the concentration of hypertonic saline, since in the study by Dogo et al.,[8] the concentration is not explicit. For fear of complications such as cutanea necrosis,[13] in this study, the concentration of the solution was defined in 2 ml of sodium chloride at 20% with 1 ml of 2% lidocaine without vasoconstrictor.

Another reason for the difference may be the volume of the solution that was infiltrated. We infiltrated enough to fill the cyst again, leaving it about the same size as before aspiration. Some bulky cysts, 3 ml were not enough to fill the cyst, and some small did not enter more than 1 ml. Perhaps in the study by Dogo et al.,[8] they infiltrated different volumes and concentrations. Measuring this may be inaccurate (as there are losses due to extravasation), but the amount can influence the sclerosing power in the treatment.

Regarding the number of infiltrations, only 1 patient of Dogo et al.[8] underwent a second infiltration, obtaining a resolution rate of 96.5%. With an infiltration, we get a resolution rate of 21.7% in 24 weeks. Of those who underwent a second infiltration, only 17.4% evolved to resolution, totaling 39.1%. With two infiltrations, we almost doubled the resolution rate, showing the benefit of a second procedure when necessary.

Dogo et al.[8] reported that 20% of their patients required using painkillers for severe pain. In this study, 20 of the 34 patients who reported pain at 4 weeks used the prescribed analgesic. Measuring pain intensity before and after treatment, a statistically significant improvement in pain was noticed, but this difference is not clinically relevant, since the difference is less than three points.[18]

Evaluating the groups separately, we observed that, regarding the pain parameter, there was a greater decrease in the healed group (77.7%) followed by the palpable and non-visible group (46.2%) and, finally, by the palpable and visible group (26.7%). Thus, we can suggest that the resolution or non-visualization of the cyst may be related to the reduction of local pain.

There was no loss of wrist movement when compared before treatment and after 24 weeks of follow-up, unlike some studies using triamcinolone, hyaluronidase, and sodium tetradecyl sulfate.[13]

There was significant functional improvement in the evaluation by the QuickDash and Brief Michigan questionnaires. This improvement was due mainly to pain and aesthetics, which were the main complaints of patients. This improvement, however, was not clinically relevant since the differences did not overcome an important minimum difference.[19]

In our study, complications using 20% hypertonic sodium chloride were frequent, but with low morbidity. Apart from pain in the first few days after infiltration, treated with a simple analgesic (paracetamol), and three patients who persisted with local paresthesia after 24 weeks (no skin sensory alteration), no complications required specific additional treatment and regressed spontaneously.

In the present study, we did not achieve the same success rate as that of Dogo et al. Some reasons for this were mentioned: technique used, concentration and volume; perhaps the sum of them can explain this difference in the results found.

As a limitation of this study, we believe that we can mention the short follow-up period since recurrences can also be observed more than 6 months after infiltration.

There is a need for further studies in this subject, mainly on the use of other sclerosing substances, since treatment with aspiration and percutaneous sclerotherapy is a technically simple procedure, easily implantable in clinical practice and can be performed on an outpatient basis, with low cost.

Conclusion

Percutaneous sclerotherapy with hypertonic saline solution is a safe method for treating dorsal synovial cyst of the wrist, but it presented a recurrence rate of 60.9%.

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Conflict of Interests
The authors have no conflict of interests to declare.

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