Dorsal Wrist Ganglion: Pilot for Randomized Control Trial Comparing Aspiration Alone or Combined with Injection of Platelet-Rich Plasma

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J Wrist Surg 2023;12:18–22.

Abstract

This pilot study assessed the feasibility of performing a randomized control trial (RCT) investigating injection with platelet-rich plasma (PRP) for dorsal wrist ganglion (DWG). Aspiration alone was compared with aspiration plus injection of PRP. Seventeen patients were enrolled. Nine patients received PRP and eight aspiration alone. Patients were followed up at 6 weeks and 1 year; recurrence of the ganglion and Patient Evaluation Measure scores were measured. At 6 weeks seven patients in the aspiration group had a recurrence and five in the PRP group, but by 1 year, this has increased to seven out of eight in the PRP group whereas in the aspiration group four had resolved leaving three out of eight patients with a ganglion still present. From the basis of our work an RCT would require a minimum of 46 patients per group; however, it is unlikely that PRP will be a panacea for ganglia. This is a Level II study.

Keywords
- platelet-rich plasma
- ganglion
- aspiration
- wrist
- dorsal

Ganglia are soft tissue tumors which consist of a cavity with a collagen wall and filled with mucin rich in hyaluronic acid, glucosamine, globulin, and albumin[1]. The wall consists of collagen fibers arranged into sheets, with occasional mesenchymal cells. The lining is largely acellular with scattered fibroblasts.[2] The cavity communicates with the joint. Although the etiology is unclear, it is thought to arise from a rent in the capsule allowing escape of synovial fluid. Note that 50% have underlying joint pathology on arthroscopy.[3]

The vast majority of ganglia present around the wrist, with 60 to 70% located on the dorsal aspect.[4] The prevalence in men is 25/100,000 and women 43/100,000.[5] Magnetic resonance imaging (MRI) studies have shown that they are present in 51% of the asymptomatic population and 19% of patients presenting with wrist pain.[6]

The most common reasons people present with their dorsal wrist ganglions (DWRs) are: cosmesis (38%), fear of malignancy (28%), pain (26%), and reduced function or sensation (8%).[7] Pain has been reported to be present in 89% of ganglia but only 19% felt it was significant.[8] They are readily detectable by ultrasound and MRI but the diagnosis is usually clinical.[9,10]

Many solutions have been sought for dorsal wrist ganglia, but each has been troubled by recurrence. Nonsurgical methods such as bursting it with firm pressure, simple aspiration ± multiple puncture, and aspiration plus steroid, hyaluronic acid, or sclerosant all have similar rates of recurrence—averaging 30 to 50%, with some studies noting recurrence rates from 18 to 93% and a 5% complication rate. Similarly, surgical excision including the whole tract, which can be performed open or arthroscopically, is reported to have recurrence rates of 0 to 59% and up to 25% complication rate. When this is considered in the light that 49% of ganglia spontaneously resolve it is clear the solution has not yet been found.[3]

received
November 3, 2021
accepted
January 31, 2022
article published online
June 8, 2022

Thieme Medical Publishers, Inc.,
333 Seventh Avenue, 18th Floor,
New York, NY 10001, USA

DOI https://doi.org/10.1055/s-0042-1744367.
ISSN 2163-3916.

Platelet-rich plasma (PRP) has been shown to be useful in many conditions and further studies are underway from bone, soft tissue, and skin grafting, to tendinopathies, nerve injuries, and even hair regrowth.[11,12] It is defined as autologous plasma with a platelet count of 1,000,000 platelets/μL. It contains seven native growth factors plus cell adhesion molecules contained within a normal clot.[13] PRP has never been associated with increased, or decreased, infection rates or induction of malignancy.[14] This study was undertaken to test the theory that PRP injected into the ganglion sac would be activated by exposure to the collagen wall resulting in an adherent clot forming in the cavity thus obliterating the space and preventing recurrence. No prior studies on the use of PRP to prevent dorsal wrist ganglia recurrence have been found.

The purpose of this study was to test PRP injection as a novel treatment and to assess the feasibility of a randomized control trial (RCT) comparing it to aspiration alone.

Methods

Study Design and Population

The study protocol and documentation were approved in advance by the Wales Research Ethics Committee 5. REC Reference: 17/WA/0425. The protocol of the study was registered in the Clinical Trials Registry. We received a grant for the provision of double ACP syringes from Arthrex. All patients were informed of the trial and its risks in writing and in person before consenting to participate. The design and reporting format conformed to the Consolidated Standards of Reporting Trials (CONSORT) guidelines.

This study was a parallel, prospective RCT. The study was conducted from December 2018 to February 2021. Inclusion criteria included patients who were 16 years or over and had a solitary DWG. Exclusion criteria included patients who lacked capacity to consent and those with significant other pathology in the same limb. All general practitioner (GP) referrals for ganglion were identified at vetting and potential participants were sent the trial information leaflet and invited to opt in for a clinical assessment. These were performed at a one-stop clinic. If the patients wished to proceed after a full explanation, then consent, randomization, and the procedure were performed that day. Randomization was performed by closed enveloped with block randomization utilizing a block size of 10 to create the sequence for 20 groups, the sequence was generated on www.randomization.com with seed number 16431.

The study was conducted at Woodend Hospital in an outpatient clinic setting. The randomization, one-stop clinic, follow-up, and analysis were performed by different researchers, with the later blinded to the intervention group.

Our primary outcome measure was recurrence rate of the ganglion, as recorded via the questionnaire in ►**Table 1**. Our secondary outcome measure was Patient Evaluation Measure score. Outcomes were collected electronically using Surgical Outcomes System (Arthrex) prior to their allocated procedure. The initial recording was performed after providing consent prior to randomization at the clinic. Follow-up questionnaires were sent electronically at 6 weeks and 1 year. Any patients not responding to two electronic reminders were contacted by telephone. Complications were assessed by a telephone call to the patient at 7 days postprocedure.

Table 1 Patient questionnaire

Question	Response list
Has your ganglion returned?	No Yes, better than before Yes, no difference Yes, worse than before
If it has returned would you want anything further done?	No Yes, repeat aspiration Yes, consider surgery

Statistical advice was sought early on and we required a group size of 91 to detect a 25% difference, 67 for 30% difference, and 46 for a 35% difference in recurrence rate. Recruitment was halted due to the ongoing COVID pandemic, with no prospect of restarting for nonurgent cases we reviewed the results and decided to end the study.

Study Protocol

All patients were clinically assessed, and informed consent taken. Those randomized to the PRP group had a blood sample taken with the ACP double syringe (Arthrex) and spun in a centrifuge to produce a sample of PRP. All patients had their ganglion aspirated in a single puncture from the distal aspect using a 19-gauge needle, with the use of a cold spray offered to each patient. Once the typical nature and volume of the aspirate was noted then either the needle was removed or the syringe containing the sample of PRP attached and the void filled with the same volume of PRP. An adhesive dressing was applied and a bandage to provide light compression of the area was advised to be worn for 24 hours. Patients were not asked to modify their activity.

Results

Seventeen patients were recruited. Nine were randomized to aspiration with PRP injection and eight to aspiration alone. One patient in the PRP group was lost to follow-up. There was no crossover between the groups. See ►**Fig. 1** for CONSORT flow diagram.

The two groups were well matched for sex distribution (F:M aspiration alone 7:2, aspiration plus PRP 7:1) but the aspiration alone group were on average 10 years older (33.9; range 23–46) than the aspiration with PRP group (23.3; range 18–29).

In the short term PRP showed a trend toward lower recurrence (PRP 62.5% vs. aspiration 100%), but by 1 year two further DWG had returned in the PRP group (87.5% ganglion present) whereas five in the aspiration group had resolved (37.5% ganglion present), summary of the questionnaire responses are shown in ►**Table 2**. PEMS score across the board were similar between the two groups, see ►**Fig. 2**.

There were no complications and no patients reported that their symptoms were worse 1 year after treatment with PRP so there are no safety concerns.

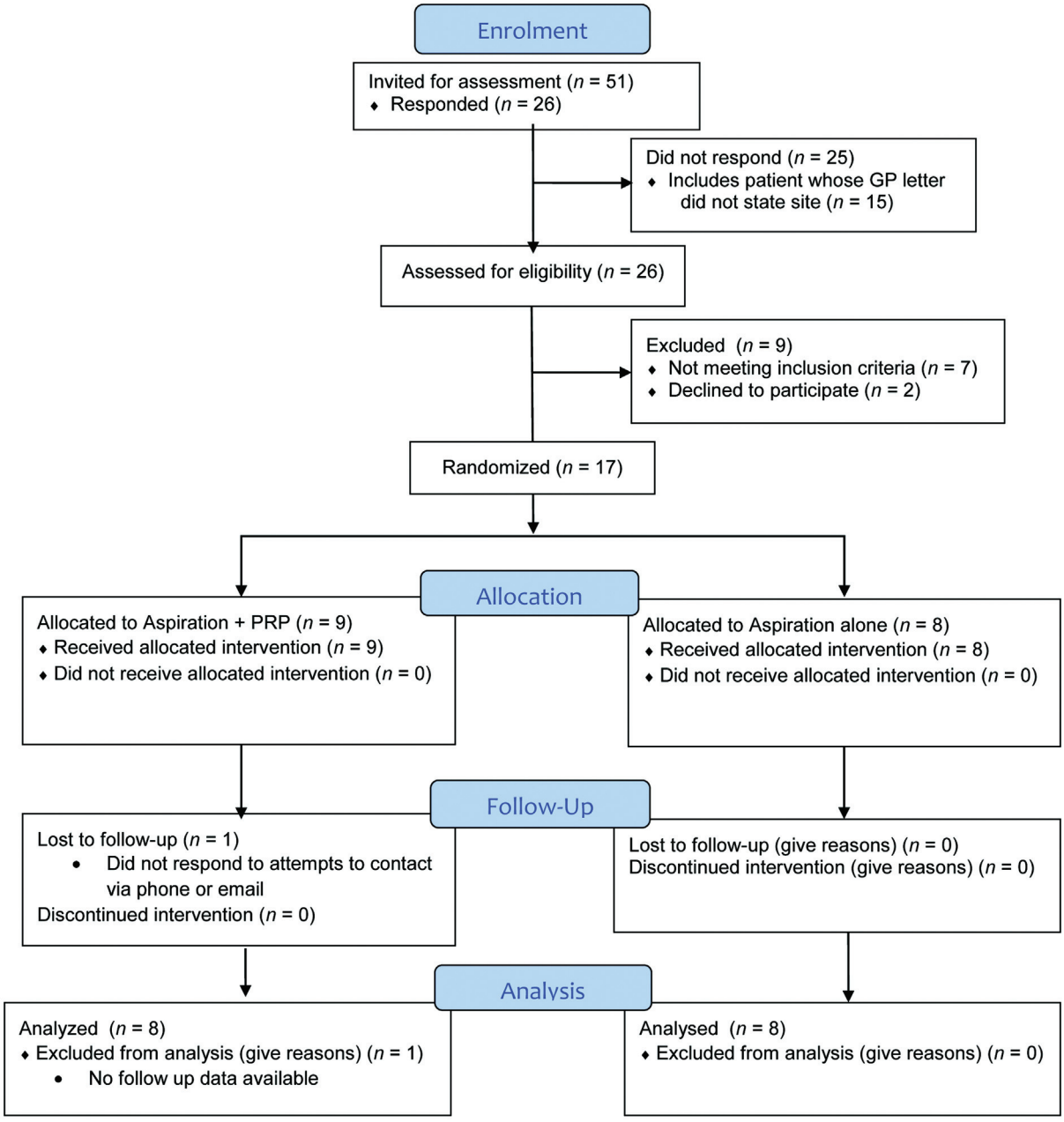

Fig. 1 CONSORT flow diagram.

Discussion

The natural history of a ganglion is for 50% to resolve spontaneously and for up to 85% to recur after aspiration alone. It is also known that recurrence rates increase rather than decrease after repeated aspiration.[3] The patients in the aspiration alone group followed this expected pattern with 100% recurrence, but with 62.5% resolving by the 1-year follow-up. The results of the PRP group showed an early recurrence rate that was no better than current accepted levels for aspiration alone, but with a tendency for later recurrence rather than resolution.

A clear limitation of the study is the small numbers of patients. However, given the unfolding of a global pandemic the treatment of a nonlife threatening and usually self-limiting condition has rightly been deprioritized. After 1 year with no prospect of return of normal service in the near future and the tendency toward equivalency of the novel treatment with the current standard treatment it was felt that it would to be appropriate to end the study early and publish the findings. To perform an RCT using this methodology would require a minimum group size of 46 to provide a 90% power to detect a difference of 35% and up to 91 per group to detect a 25% difference. To allow for 33% recruitment from written invitation to one-stop clinic and a 10% dropout rate during following up 300 to 600 patients would need to be identified and therefore a multicenter approach may be useful.

The additional equipment required for processing the sample makes PRP with aspiration significantly higher in

Table 2 Results of recurrence questionnaire

	Aspiration + platelet-rich plasma (PRP)	Aspiration alone
6/52 Ganglion return?	No – 3 Yes better – 2 Yes same – 2 Yes worse – 1	No – 0 Yes better – 4 Yes same – 2 Yes worse – 2
6/52 Further treatment?	No – 1 Yes aspiration – 4 Yes surgery – 3	No – 0 Yes aspiration – 4 Yes surgery – 4
1 year Ganglion return?	No – 1 Yes better – 4 Yes same – 3 Yes worse – 0	No – 5 Yes better – 1 Yes same – 2 Yes worse – 0
1 year Further treatment?	No – 1 Yes aspiration – 5 Yes surgery – 2	No – 5 Yes aspiration – 2 Yes surgery – 1

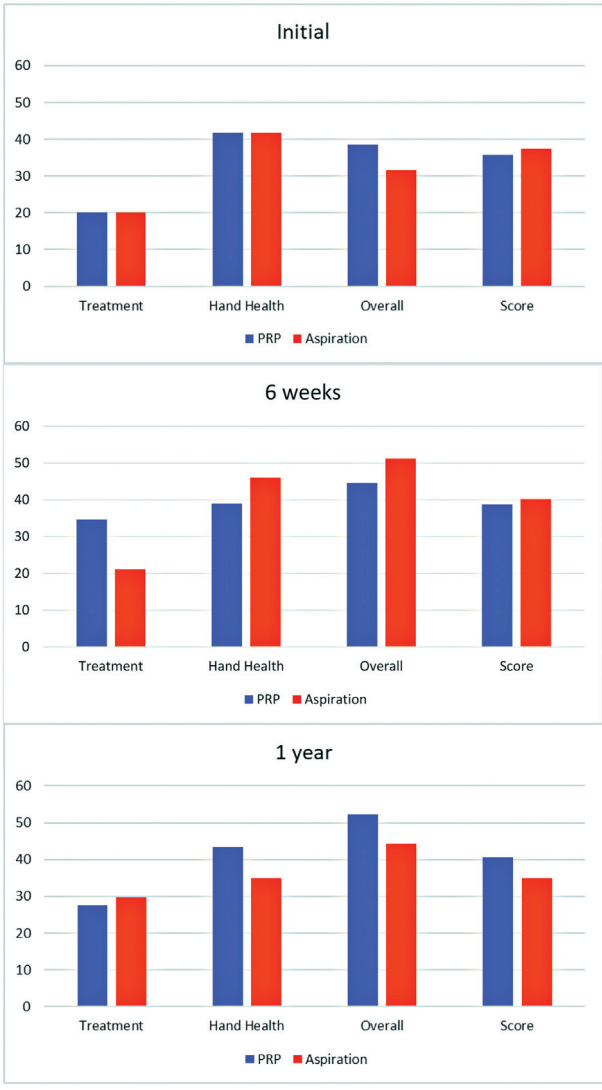

Fig. 2 Patient Evaluation Measures.

cost than simple aspiration and requires the procedure to be provided in a secondary care setting with access to the centrifuge rather than the GP/community setting, thus blocking access to those requiring the expertise of a hand surgeon. Based on this pilot study we believe it is unlikely that PRP will be the panacea treatment for ganglions that it would need to be in order to justify the increase in cost and resources required.

Note

The trial was registered on clinicaltrials.gov—Record Number: 1/091/17 (NCT03408808).

Ethical Approval

The research protocol was approved in advance by the Wales Research Ethics Committee 5. REC Reference: 17/WA/0425. Only anonymized data are presented and therefore no specific consent is required.

Authors' Contributions

K.H.: Design of protocol, data acquisition, and write up; Y. K.: Data analysis and write up; A.H.: Randomization, data analysis; C.M.: Protocol design; and D.L.: Protocol design and write up.

Funding

This work was supported by Arthrex, with the provision of ACP double syringes.

Conflict of Interest

None declared.

Acknowledgment

The authors thank the Statistics Department University of Aberdeen and Arthex.

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