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ORIGINAL ARTICLE

Glucocorticoid injections for greater trochanteric pain syndrome: a randomised double-blind placebo-controlled (GLUTEAL) trial

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Abstract

Small observational studies suggest that local glucocorticoid (GC) injection may be effective in the management of the greater trochanteric pain syndrome (GTPS). The objective was to perform the first randomised double-blind placebo-controlled trial to investigate the efficacy of local GC injection in the management of GTPS. The trial was conducted between November 2011 and May 2015. Inclusion criteria included lateral hip pain (LHP) for greater than 1 month, a LHP score of ≥ 4/10 and typical LHP reproduced by palpation of the greater trochanter. Participants were randomised in a 1:1 ratio to injection with a combination of local anaesthetic and GC (intervention) or injection with normal saline solution (placebo). The primary outcome of interest was the difference in pain intensity at 4 weeks post-injection between the two groups. Patients were followed for 6 months. A total of 46 patients were included. There were no significant differences between the two groups in terms of pain reduction at 1 month ($p = 0.23$). When including all measures in the first 4 weeks and using multilevel regression, there was a trend towards improvement in pain scores in favour of the intervention group ($p = 0.08$). There were no significant differences in pain scores between groups at 3 and 6 months. In the management of GTPS, local glucocorticoid injections are of no greater efficacy than injection of normal saline solution. Given the lack of long-term improvement and the potential for cortisone-related side effects, this intervention is of limited benefit.

Keywords Glucocorticoids · Hip joint · Injections · Pain · Tendinopathy

Introduction

The greater trochanteric pain syndrome (GTPS) is a frequent soft tissue syndrome with an incidence of up to 5.6 per 1000/year and has a ratio of women to men of around 4:1 [1–3]. The prevalence of GTPS amongst adult patients referred to a spine clinic for chronic low back pain is 20–35% [4–7]. The reproduction of typical pain on palpation of the

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postero-lateral part of the greater trochanter is the only well-recognised clinical sign, although other clinical signs have been described [8, 9].

Currently, there is no validated definition of this syndrome and it is classically defined as pain and tenderness in the region of the greater trochanter that may radiate down the postero-lateral aspect of the thigh and mimic nerve root compression [1, 4]. Hence, patients may often be treated for months or years for a presumed diagnosis of hip osteoarthritis or lumbar radiculopathy before being referred to a specialist. In addition to pain, GTPS results in considerable functional disability, with scores similar to that seen with advanced hip osteoarthritis [10] and which may profoundly interfere with patients' daily activities [11]. The prognosis is poor for a substantial proportion of GTPS patients, with 36% describing ongoing symptoms at 1 year and 29% at 5 years [11].

There are very few well-performed studies regarding the treatment of GTPS and a recent review concluded that there is a "paucity of high-quality research for the conservative treatments of GTPS" [12]. Some advocate physiotherapy, but there is no strong evidence to support this approach. Although poorly studied, analgesics and nonsteroidal anti-inflammatory drugs (NSAIDs) are often used as first-line management [11, 13]. As a result of the chronicity of this condition and the frequent sub-optimal responses to the above therapies, patients are often treated with a local injection of a combination of a glucocorticoid (GC) and a local anaesthetic (LA). Small observational studies and retrospective studies suggest that a local GC injection may be effective in the short term [14–16]. Similarly, two randomised controlled trials (RCT) [17, 18] demonstrated short-term improvements in pain, although neither of these trials included a true placebo arm. The aim of our study was to establish the efficacy of GC injections in the GTPS by means of a randomised placebo-controlled trial (PCT).

Methods

The GLUTEAL (GLUcocorticoid injections for greater TrochantEric pain syndrome: A randomised doubLe-blind placebo-controlled) trial is a randomised PCT that was conducted at the Geneva University Hospital in Switzerland. The trial complied with the Declaration of Helsinki, the local ethics committee approved the trial (number 10-213) and all participants provided informed written consent prior to inclusion. The trial was retrospectively registered with ClinicalTrials.gov (NCT01807962) in March 2013.

Study population and design

Patients aged ≥ 18 years were recruited from both the inpatient and outpatient clinics of the departments of Rheumatology and Orthopaedics of the Geneva University Hospital, as well as from a private orthopaedic practice. Inclusion criteria included the following: lateral hip pain (LHP) for greater than 1 month, typical LHP reproduced by palpation of the greater trochanter, a numerical rating scale (NRS) LHP score (ranging from 0 to 10) of ≥ 4 and failure of another standard treatment (such as an analgesic treatment, including, but not limited to NSAIDs; or physiotherapy). All pain scores were evaluated with the NRS.

Exclusion criteria included a history of concomitant local surgical intervention, previous ipsilateral prosthetic hip surgery, scheduled ipsilateral hip surgery within 3 months, fibromyalgia, flair of chronic inflammatory joint disease, skin lesions at the injection site, allergy to one of the study drugs, anticoagulation, blood coagulation disorder, serious and uncontrolled psychiatric disease, uncontrolled diabetes, unstable hypertension, open or closed angle glaucoma and pregnant or breast-feeding women. Further details on the exclusion criteria can be found online (Supplementary file 1).

Randomisation and blinding

Participants were randomised in a 1:1 ratio to one of two treatment groups: (1) injection with a combination of LA and GC (intervention group) or (2) injection with normal saline solution (placebo group) without LA. The intervention group received 4 ml of 1% lidocaine (Rapidocain®) and 1 ml of betamethasone (Diprophos®, containing 5 mg/ml of betamethasone-dipropionate and 2 mg/ml of betamethasone disodium phosphate). The placebo group received 5 ml of sterile saline solution.

The baseline visit and randomisation were performed within 15 days of the screening visit. The randomisation list was generated with a dedicated computer program. In order to avoid disequilibrium, the randomisation was performed by blocks of 4. Pairs of sealed envelopes containing the treatment group were prepared. For each patient, an independent nurse collected the first envelope and prepared the injection according to the treatment group indicated. As the injection with LA and GC is a cloudy opaque colour and the placebo is a clear solution, all syringes were carefully concealed using "aluminium paper" so that the physician performing the injection and the patient were blinded to the treatment allocation. The other paired sealed envelope was kept separately, in case of a serious adverse event (SAE) for which the knowledge of the randomisation was required.

Outcomes and exposures

The study's primary outcome of interest was the efficacy of ultrasound-guided injection of LA and GC compared with placebo at 4 weeks. The primary endpoint was the difference in NRS pain intensity at the lateral hip at 4 weeks post-

injection, between the two treatment groups. Given that the duration of the response to a soft-tissue GC injection is not well established, we also examined pain scores longitudinally. The timing of the primary outcome at 4 weeks was selected as this was considered to be long enough to observe a clinical effect of the intervention and was not of greater duration for ethical reasons (delay for an "active" therapy in the placebo group).

Secondary outcomes included safety (including pre-defined adverse events (AE) of interest and other AE), the number of "responders" (defined as a reduction in NRS pain ≥ 1.5), the number of patients with "low disease activity" (defined as NRS pain ≤ 2.0) and efficacy outcomes based on the number of GC injections received (0, 1 or 2). The following patient-reported outcomes were also collected: patient global impression (PGI) recorded on a 5-point Likert scale (from "worse" to "completely pain free"), the Oswestry low back pain questionnaire (10 questions scored out of 5 for a total of 50 to assess functional disability) [19], the Western Ontario and McMaster Universities Arthritis Index (WOMAC, consisting of 15 questions in the visual analogue score (VAS) format (1–100) to assess hip joint pain (5 questions), stiffness (2 questions) and physical function (8 questions)) [20] and the SF-12 (with both physical and mental composite scores (PCS and MCS)) [21]. Local NRS pain was assessed 30 min after the injection in order to investigate an immediate analgesic effect of the LA that may have influenced the blinding.

Study visits

Following the screening visit, all patients were reviewed at baseline, 4 weeks, 3 months and 6 months. At the week 4 visit, patients were administered an ultrasound-guided injection of LA and GC at the same dose as previously described (i.e. no placebo injection at week 4) if they demonstrated an inadequate response to the initial injection, defined as failing to achieve "low disease activity", regardless of the nature of the first injection. Patients injected a second time were reviewed again at 8 weeks (4 weeks after the 2nd intervention). However, this second injection was not performed if any of the exclusion criteria (as previously defined) were present. Additionally, in the event of a SAE, no further injections were administered. A change in dose of oral steroids or a parenteral steroid injection similarly constituted exclusion to the second injection.

Following each visit at which an injection was performed (baseline ± 4 weeks), patients recorded their pain daily using a NRS diary for a total of 7 days. In addition, patients were contacted by telephone once a week for a total of 3 weeks, and with the use of a standardised questionnaire, information was collected on their pain level, overall improvement on a Likert scale, whether they considered themselves to be "cured", the presence of an AE, and whether they had utilised other therapies, such as medications, physiotherapy or another local injection.

Concurrent treatments

Participants were requested to avoid the use of additional analgesics and dose modification of pre-existing analgesics until the first post-injection medical appointment at 4 weeks. Participants were also requested to refrain from using any other therapy (physiotherapy, hydrotherapy or acupuncture) until the first post-injection medical appointment, but if other therapy was utilised, the number and type of sessions were recorded.

Injection procedure

Patients were placed in the lateral position with the affected side upwards and a small cushion between the knees to avoid compression of the trochanteric bursa. No subcutaneous anaesthesia was performed prior to the blinded injection. Following standardised skin sterilisation protocol and under direct real-time ultrasound guidance, the tip of the needle was positioned either within the peri-trochanteric bursa (if visualised), or otherwise at the surface of the distal gluteus medius tendon near its insertion at the postero-lateral facet of the greater trochanter and deep to the tensor fascia lata. The injection was performed into the peri-tendinous region, superficial to the tendon (not directly into the tendon body), as previously described in the literature [22]. A 22-gauge sterile needle of 70-90 mm (adapted to the patient's morphology) was utilised.

Rescue therapy

In the event of persistent pain following the intervention, the participant was permitted to continue a stable dose of the pre-existing analgesics. In the case of a requirement for additional analgesia after the intervention for pain in the lateral hip region, the patient was instructed to contact one of the study investigators to discuss the need for supplemental analgesia. The quantity and duration of any additional analgesia was recorded. At the week 4 visit, patients were administered a US-guided injection of LA and GC if they demonstrated an inadequate response to the initial injection.

AE monitoring

The occurrence of an AE was investigated with the use of a standardised questionnaire during the weekly phone calls following each intervention. In addition, at each clinical visit following the intervention, a detailed history and clinical examination were performed to identify potential AE. AE of

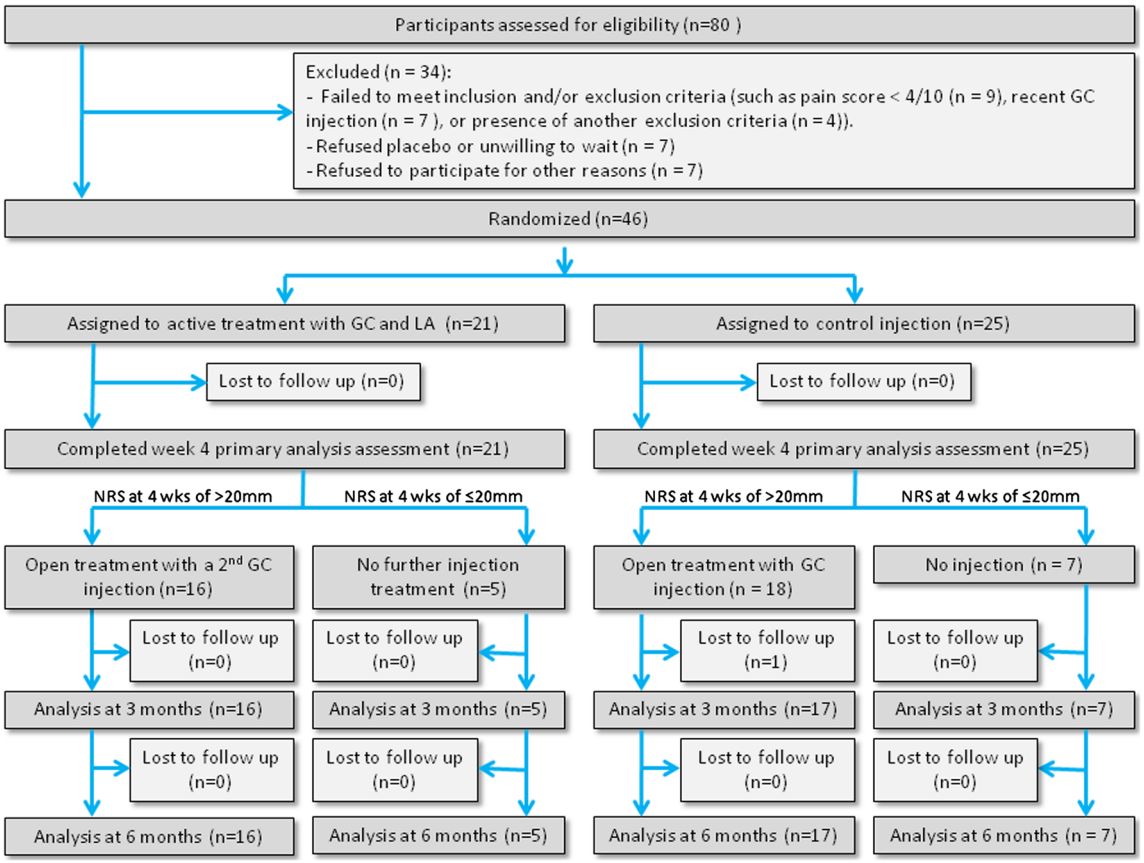

Fig. 1 Participant flow chart

special interest were infections, allergy or hypersensitivity reactions, local bleeding or hematoma, local cutaneous side effects, acute systemic toxicity, changes in blood glucose levels, weight gain and flushing.

Data availability Please contact author for data requests.

Statistical analysis

The minimum clinically important difference (MCID) for the 100 mm VAS is 12 mm (95% CI 9–15 mm) [23]. The MCID for the 0-10 NRS for pain ranges from 1.0 to 2.0 [24, 25], although there are no psychometric studies relating specifically to the hip. The VAS and the NRS are essentially the same, with the only difference being that the numbers from 0 to 10 are written with the NRS. The NRS was chosen because it can be administered by telephone. Our goal was to detect a mean difference of ≥ 1.5 in the NRS between the two groups. Based on a similar randomised PCT for lateral epicondylalgia [26], with an alpha error of 0.05 and a beta error of 0.1, we calculated that 31 patients were required in each group. Estimating a dropout rate of approximately 10%, the requirement for a total of 70 patients was predicted.

Regarding the baseline characteristics, categorical variables were compared between groups using the chi-squared test. We utilised standard descriptive statistics to test for differences in mean values. For non-symmetrically distributed variables, the Mann-Whitney test was utilised. All tests were two-sided, with a significance level set at 5%. An intention to treat analysis was preformed to analyse the primary outcome at 1 month. We used multilevel linear regression to examine the evolution of pain over time while accounting for the repeated measure design.

Results

Patient disposition and characteristics

A total of 80 patients were assessed for eligibility (Fig. 1 summarises patient recruitment, inclusion, follow-up and attrition) between November 2011 and May 2015. Twenty patients did not meet our inclusion/exclusion criteria and a further 14 patients declined participation, predominantly due the fact that there was a placebo arm.

Due to slower than expected recruitment at the 3-year mark following the first included patient, a meeting of the investigator group was held in January 2015. Pre-defined criteria were established and an interim analysis was conducted by an independent statistician, including 39 patients (18 in the

Table 1 Baseline patient characteristics. Except where indicated otherwise, values are the mean (± standard deviation). IQR, interquartile range; GT, greater trochanter; BMI, body mass index; SF-12, 12-Item Short Form Health Survey

	Active treatment $n = 21$	Placebo $n = 25$	p value
Age (years)	56.6 [14.6]	59.6 [13.1]	0.46
Sex (%, female)	81.0	88.0	0.51
Weight (kg)	74.4 [15.1]	74.7 [15.8]	0.95
Height (cm) [median, IQR]	162 [159,168]	160 [153,164]	0.18
BMI	27.9 [6.1]	28.8 [4.9]	0.59
Pain over past 24 h	6.1 [1.5]	6.6 [1.8]	0.29
Pain on palpation of GT	6.6 [2.0]	7.1 [1.9]	0.40
Past injection of GT (% yes)	38.1	40.0	0.92
SF-12 (/100)[a]	35.3 [8.3]	34.8 [8.3]	0.85
Oswestry total score (/50)[b]	39.9 [13.1]	39.9 [14.9]	0.99
WOMAC pain score (/500)[b]	251.4 [80.5]	247.2 [87.2]	0.87
WOMAC function score (/800)[b]	414.6 [154.9]	366.1 [175.7]	0.33

[a] Low values indicate lower quality of life, while high values indicate higher quality of life

[b] High values indicate more pain or lower physical functioning

intervention group and 21 in the placebo group) to determine whether recruitment should be continued. This analysis demonstrated a negative effect size (numerically greater benefit in the placebo group) and no statistically significant difference in the reduction of pain between the intervention group and the placebo group at 1 month. It was therefore decided to cease recruitment due to futility. Seven patients who had already been included in the trial but for whom data was not yet available for the interim analysis completed the follow-up period.

Consequently, 46 patients were included in the study and randomised: 21 to active treatment and 25 to placebo (Table 1). Complete follow-up data was available for 100% of patients at 1 month and for 98% at 3 and 6 months. At baseline, 85% of the patients were female with a mean age of 58.2 years (± 13.7), a mean body mass index of 28.4 (± 5.4) and a mean pain NRS of 6.4 (± 1.7). No significant differences were demonstrated in the baseline patient characteristics between the two groups, suggesting that randomisation was successful.

The reduction in pain 1 month after injection was similar between the intervention group (− 1.5) and the placebo group (− 2.5) ($p = 0.23$). There were no significant differences in pain scores between the two groups at any individual time point during the first 4 weeks. When including all pain measures in the first 4 weeks and using a multilevel regression model, there was a trend towards improvement in pain scores in favour of the intervention group ($p = 0.08$) (Fig. 2). The percentage of responders at 1 month in the intervention group (48%) and the placebo group (56%) ($p = 0.32$) was almost identical. We explored responder status at 4 weeks, with no significant differences identified between responders and non-responders with regard to age, sex, weight, presence of low back pain, previous steroid injection and the presence of pain on hip abduction.

Similarly, the percentage of patients with low disease activity in the intervention group (19%) and placebo group (28%) ($p = 0.50$) was not significantly different. The reduction in pain at subsequent follow-up visits in the intervention and placebo groups was also similar, with scores of − 2.0 and − 3.1 ($p = 0.19$) at 3 months and of − 2.6 and − 2.7 ($p = 0.85$) at 6 months, respectively.

We explored the outcomes at 6 months in patients with a single placebo injection, a single GC injection and in those who benefited from two GC injections. At 6 months, there were no significant differences in terms of low disease activity, percentage of responders, change in pain scores and multiple questionnaires (Table 2). Moreover, the pain score at 30 min post-injection was not a predictor of responder status ($p = 0.37$). There was a trend towards greater pain improvement at 30 min in the placebo group compared with the intervention group (− 2.9 vs. − 1.8, $p = 0.097$) (Supplementary file 2).

With regard to the safety outcomes at 1 month, 1 patient reported weight gain and two patients presented with raised blood glucose levels in the intervention group. No significant differences were identified between the two groups in any of the predefined safety outcomes (Table 3). At 6 months, the probability of a patient experiencing an adverse event was 42.9% in the placebo group, 82.6% in the group with a single GC injection and 87.5% in the group with two GC injections ($p = 0.037$) (Supplementary file 3). A total of 10 SAEs in 6 patients were recorded during the trial. All SAEs were considered by the investigators to be unrelated to the trial drug. Further information regarding the SAEs can be found online (Supplementary file 4).

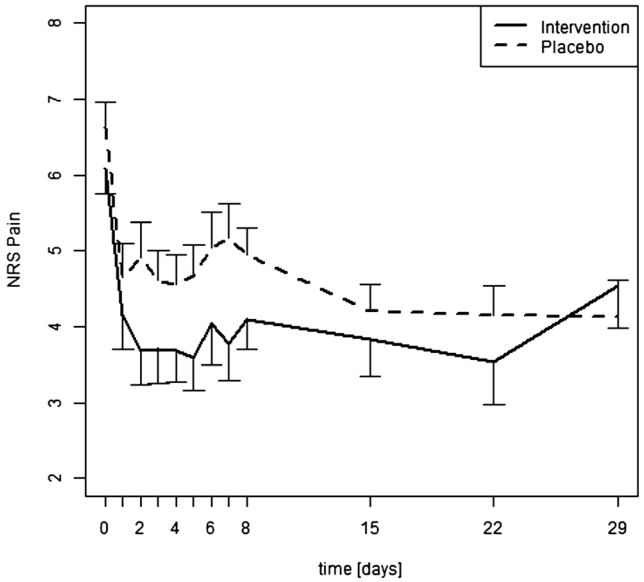

Fig. 2 Changes in NRS (numeric rating scale) pain scores over the first 4 weeks in patients with local glucocorticoid and local anaesthetic injection (intervention group) versus patients with a normal saline injection (placebo group)

Discussion

This is the first double-blind randomised PCT assessing the efficacy and safety of GC injections for the greater trochanteric pain syndrome. We demonstrate that in patients with GTPS, the local injection of glucocorticoid is of no greater efficacy than a placebo injection of normal saline at 1, 3 and 6 months.

There appears to be a proportion of patients that respond extremely well to a local injection, regardless of its nature (GC or placebo) (Supplementary file 5). This is certainly due in part to the placebo effect and the invasiveness of the placebo intervention has been correlated to its efficacy [27, 28]. In our study, 12 patients (26%) considered themselves "cured" at 1 month with a mean NRS pain score of 1/10 and interestingly, the majority of these patients were in the placebo group.

In contrast to these findings, several RCTs demonstrated a short-term benefit of GC injection of up to 3 months in patients with GTPS. In an open randomised trial of GC injection versus "usual care" in 120 patients, GC injection was significantly more effective at 6 weeks and at 3 months, with no differences at 6, 9 or 12 months [17]. In a review article by Barratt et al., it was concluded that there was a high risk of detection bias in this paper [12]. A RCT of home training (with progressive slow repetitive exercises) versus GC injection (25 mg of Prednisone) versus radial shock wave therapy demonstrated a significant advantage in favour of the GC injection at 4 weeks, although the shock wave therapy was statistically superior at 4 months [18]. Similarly, there was no true placebo arm in this trial and the presence of a high risk for selection bias [12]. In a recent prospective, non-blinded, randomised trial of 43 GTPS patients, the authors found that dry-needling local trigger points (with a mean of 5.4 sessions) around the greater trochanter was non-inferior to a single local GC injection [29].

In a randomised blinded PCT of similar design to our trial, in patients with epicondylalgia, Coombes et al. reported that the use of a local GC injection was no better than placebo and resulted in worse clinical outcomes compared with placebo at 6 and 12 months [30]. Similarly, we demonstrated numerically worse outcomes at 6 months in patients with GC injection compared with placebo in terms of the percentage of patients with low disease activity (particularly in patients with 2 GC injections), the percentage of responders and with regard to the change over time in multiple patient-reported outcomes (Oswestry, Woman pain, Woman function and SF12-PCS). The lack of statistical significance between the 3 groups may

Table 2 Clinical outcomes at 6 months based on the number of glucocorticoid (GC) injections received (0, 1 or 2 injections). Except where indicated otherwise, values are the mean (± standard deviation).

	Only placebo injection $n = 7$	Single GC injection[#] $n = 23$	Two GC injections $n = 16$	p value
Low disease activity	57.1%	45.5%	18.8%	0.14
Responders (%)	71.4%	63.6%	56.3%	0.47
Δ 24 h pain score	− 3.6 (3.1)	− 3.0 (3.5)	− 1.8 (2.3)	0.27
Δ Oswestry questionnaire	− 31.2 (14.2)	− 24.2 (13.6)	− 26.2 (12.3)	0.60
Δ WOMAC pain questionnaire	− 103.6 (111.4)	− 71.4 (145.2)	− 67.8 (128.7)	0.76
Δ WOMAC stiffness questionnaire	− 27.3 (65.2)	− 45.4 (60.6)	− 20.6 (56.2)	0.36
Δ WOMAC function questionnaire	− 162.6 (229.5)	− 95.8 (233.7)	− 102.8 (203.9)	0.70
Δ SF12 PCS questionnaire	9.3 (7.7)	2.7 (8.2)	4.9 (8.9)	0.22
Δ SF12 MCS questionnaire	0.6 (10.1)	1.7 (14.0)	− 0.3 (9.4)	0.71

SF-12, 12-Item Short Form Health Survey; PCS, physical component score; MCS, mental component score

Δ = Change over the 6-month follow-up. p values were computed using a trend test for categorical variables, and Kruskal-Wallis test for continuous variables

[#] Patients with a single GC injection: 5 patients injected with GC in the first round and subsequently required no further therapy and 18 patients initially in the placebo group who required a GC injection at 1 month

Table 3 Adverse effect outcomes at 1 month in the intervention group and the placebo group. AE, adverse event; SAE, serious adverse event; BSL, blood sugar level

	Intervention group $n = 21$	Placebo group $n = 25$	p value
Patients with ≥ 1 AE	62%	64%	1.0
Number of SAE	1	1	ns
Flushing	14%	12%	1.0
Weight gain	5%	0%	0.46
Local infection	0%	0%	1.0
Increased BSL	10%	0%	0.20
Other side effect	52%	48%	1.0

be due to the small sample size. Selection bias may partly explain the inferior outcomes in patients with two GC injections. In any case, it appears that two GC injections 1 month apart are no better than a single GC injection and may potentially lead to worse outcomes.

Recent research suggests that chronic tendon pathologies are better considered as "tendinopathies" rather than "tendinitis", as several studies have demonstrated the absence of acute inflammatory cells (such as polymorphonuclear leucocytes) [31], although no study has directly investigated GTPS. There are numerous deleterious effects of GC on tendon cells, such as reduced cell viability, cell proliferation and collagen synthesis, as well as increased collagen disorganisation and necrosis, and subsequently a deterioration of the mechanical properties of the tendon [32] which may explain the poor functional outcomes.

At 1 month, there were no significant differences in terms of side effects between the two groups; however, there was a significantly higher rate of side effects in patients who had received at least one GC injection, compared with the placebo group at 6 months and most SAEs occurred in patients with two GC injections. No cases of local infection, tendon rupture, allergy or hypersensitivity reactions, local bleeding, hematoma or acute systemic toxicity were observed. In the literature, a number of systemic complications following extra-articular GC injection have been reported, such as flushing, menstrual abnormalities and Cushing's syndrome, although these events are not systematically investigated and are probably underreported [33, 34].

A potential limitation of this trial is that the predefined number of patients was not obtained. The interim analysis clearly suggested the need to cease recruitment due to futility. For ethical and economic reasons, futility monitoring has become a widely accepted component of clinical trial methodology [35]. Given the clear lack of difference between the two groups, it is highly unlikely that a larger study population would have led to different conclusions. As patient recruitment was from the rheumatology and orthopaedic departments of a large university teaching hospital and from a private practice orthopaedic clinic, our conclusions may not be directly applicable to a population of general practice patients with GTPS.

Our study has a number of strengths, such as the randomised and placebo-controlled design and particularly the double-blinding. It is thought that the injection of LA leads to a rapid improvement in local pain in GTPS which may potentially lead to a loss of blinding, as patients experiencing a reduction in pain immediately after the injection of LA and GC could infer which study arm they were allocated to. However, we found no significant differences between the two groups in terms of the proportion of patients with a reduction in pain or the overall mean pain reduction at 30 min post-injection.

This study supports a growing body of evidence suggesting that chronic tendinopathies respond at best poorly to local GC injection and that patients injected with cortisone may indeed present with inferior functional outcomes in the long term. Even well-designed and well-performed RCTs without a true placebo group are probably inadequate to evaluate the efficacy of these types of interventions, due to the importance of the placebo-effect.

Conclusions

Among patients with GTPS, we demonstrate that local glucocorticoid injection is of no greater efficacy than a local injection of normal saline. Given the lack of long-term improvement and the potential for cortisone-related side effects, local glucocorticoid injection is of limited benefit for this syndrome. Further randomised PCTs with larger patient numbers and the inclusion of patients from general practice are required to confirm these findings prior to excluding glucocorticoid injection as a treatment option for GTPS. Nevertheless, practitioners need to discuss with their patients the limited duration of benefit from a GC injection and the potential side effects.

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Authors' contributions MN designed the trial, performed the patient visits, involved in data collection, monitored data collection, cleaned and analysed the data, statistical analysis and drafted and revised the paper. He is guarantor.

LB designed the trial, performed the patient visits, involved in data collection, monitored data collection and drafted and revised the paper.

AFa designed the trial, monitored data collection and drafted and revised the paper.

AFi designed the trial, monitored data collection, analysed the data, statistical analysis and drafted and revised the paper.

DC monitored data collection, cleaned and analysed the data, statistical analysis and drafted and revised the paper.

SG designed the trial, performed the patient visits, involved in data collection, monitored data collection, analysed the data and drafted and revised the paper. He was the sponsor and principal investigator.

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Compliance with ethical standards

Ethics approval The local ethics committee at the Geneva University Hospital approved the trial (number 10-213).

Consent to participate All participants provided informed written consent.

Disclosures None.

Abbreviations *AE*, adverse events; *GC*, glucocorticoid; *GTPS*, greater trochanteric pain syndrome; *LA*, local anaesthetic; *LHP*, lateral hip pain; *MCS*, mental component score of the SF-12; *NRS*, numerical rating scale; *NSAIDs*, nonsteroidal anti-inflammatory drugs; *PCT*, placebo-controlled trial; *PCS*, physical component score of the SF-12; *RCT*, randomised controlled trials; *SAE*, serious adverse event; *SF-12*, 12-Item Short Form Health Survey; *VAS*, visual analogue score

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