

Driving Safety After Hip Injections: Brake Response Times

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Abstract

Aims

Hip inflammatory conditions such as trochanteric bursitis and osteoarthritis significantly impact functional ability. While hip arthroplasty is common, hip injections are a less invasive pain management option for these conditions. Concerns about driving safety post-injection have led to guidelines advising against driving for 12–24 hours. This study assesses brake response time (BRT) before and after hip injections to determine driving fitness.

Methods

In this prospective study, 55 patients scheduled for steroid and local anaesthetic hip injections at a National Orthopaedic Hospital were recruited. BRT was measured using a brake response machine both before and 30 minutes after the injection. Pain levels were assessed using the Visual Analog Scale (VAS). Paired t-tests compared pre- and post-injection BRT and VAS scores.

Results

This study included 64 hips in patients with a mean age of 61.6 years. There was no significant difference in mean BRT pre- and post-injection (0.83 vs 0.84 seconds, $p = 0.856$). VAS scores significantly decreased post-injection (4.94 vs 3.52, $p = 0.0243$).

Discussion

BRT was unaffected post-hip injection, suggesting patients can safely drive after receiving one. This result can impact patient experience of attending for an injection. Larger future studies assessing other driving factors are recommended.

Introduction

Inflammatory conditions of the hip such as trochanteric bursitis and osteoarthritis are increasingly prevalent with significant impacts on quality of life and functional ability. Globally the burden of hip OA is substantial, affecting 8.55% of the population¹. Furthermore, the prevalence of trochanteric bursitis is 15% in individuals aged 50-79 years old². These statistics underscore how common these conditions are and highlight the need for effective management strategies.

In managing these musculoskeletal conditions, several treatment modalities aim to mitigate symptoms and improve function. A common option is hip arthroplasty, however, hip injections offer a minimally invasive option for managing hip pain and inflammation. Intra-articular injections deliver corticosteroids directly into the hip joint, targeting inflammation and providing relief, while greater trochanteric injections target bursitis around the hip joint³. Despite their promise in alleviating symptoms, questions remain regarding patient safety, particularly, their ability to drive.

The local hospital guideline advises against patients driving until 12-24 hours after the procedure due to impaired mobility and driving function. As a result, these patients have to undergo the stress of arranging a form of transportation after their injection, potentially prolonging discharge and imposing a logistical and economic burden. Previous studies have explored the effect of lower-limb procedures on brake response time (BRT), which scientists have established as a strong metric for evaluating a patient's fitness to drive⁴⁻⁷. Notably, studies have found no significant difference in BRT following intra-articular knee injections⁶. However, given the hip joint's substantial role in weight-bearing and movement coordination during driving, exploring BRT following hip injections may provide more valuable insights into driving safety than knee injections.

In this study, we aim to fill the literature gap and conduct the first prospective study on the braking ability of patients before and after hip injections based on BRT. We hypothesize an insignificant change in BRT post-injection, thus demonstrating that patients are fit to drive after their injection.

Methods

This study used a prospective observational study design. After institutional board approval, 55 patients scheduled for a hip injection were consecutively recruited at the National Orthopaedic Hospital Cappagh, Dublin, Ireland between January 2024 and May 2024. Inclusion criteria included patients receiving either greater trochanteric or intra-articular hip injections. Patients were excluded if they had a comorbid condition such as a neurological disability or unrelated cause of lower limb weakness. Upon identifying eligible patients, they

were approached on the day of their hip injection and invited to participate and informed consent was obtained. Of the 71 people identified on the patient schedule for hip injections, 11 did not attend for their appointment, 3 were ineligible due to co-morbid conditions (cerebral palsy, unrelated cause of lower limb weakness, and amputees), and two declined to participate in the study (see Table 1).

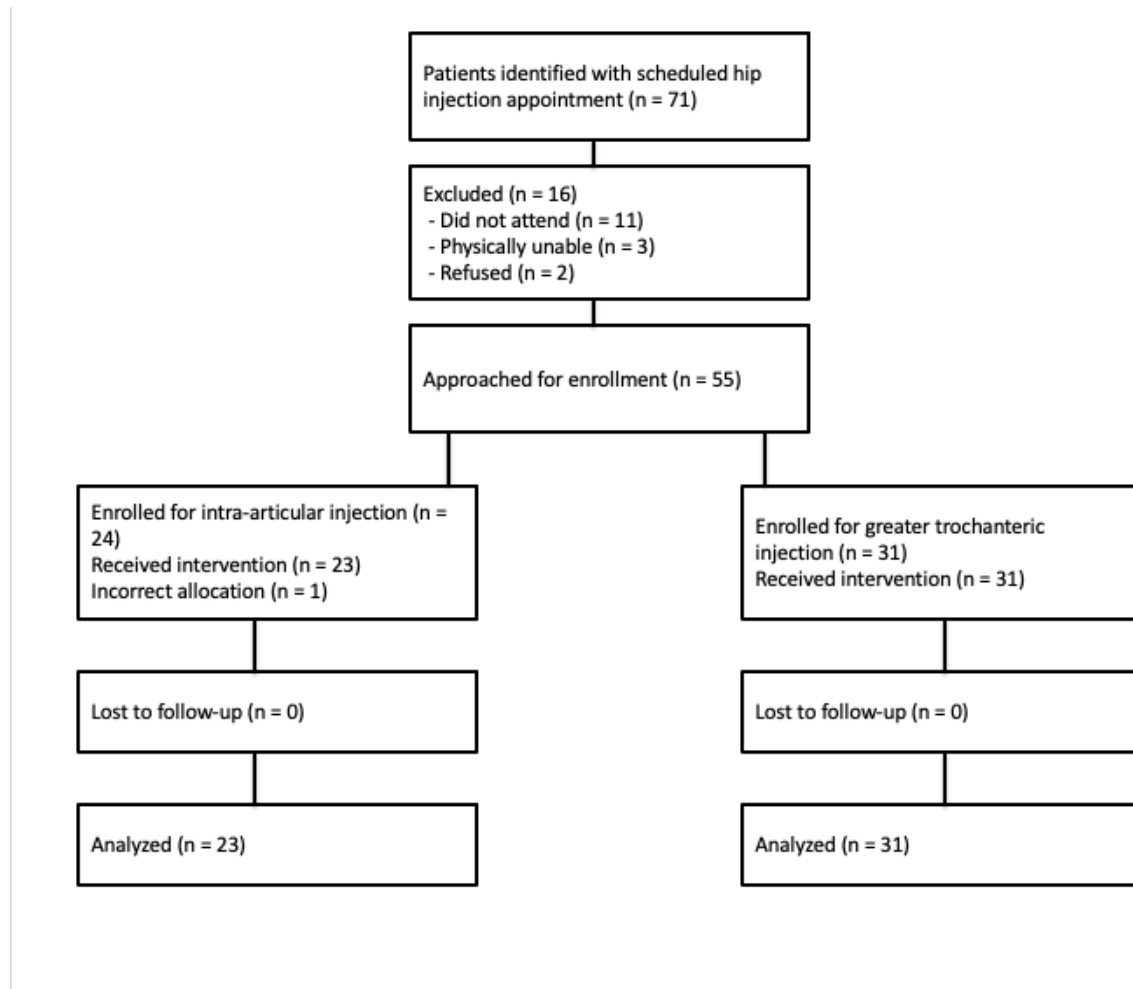


Table 1: Flow diagram of patient recruitment and analysis

Patients received injections consisting of Depomedrone-Methylprednisolone 40mg mixed with 8ml of Marcaine 0.25%. Upon obtaining informed consent and recruitment, participants were asked to perform a brake response test on the side that they were receiving their injection, using a brake response machine. This was used to measure the primary outcome, BRT, to evaluate fitness to drive. This was measured before and approximately 30 minutes after the injection where participants underwent a practice test followed by three consecutive BRT trials. This was recorded as an average to ensure reliability of measurements and reduce random error.

Our secondary outcome measure was pain. Participants were also asked to rate their pain using the Visual Analog Scale (VAS) ranging from 1 to 10, with 1 representing no pain and 10 representing the worst imaginable pain. Demographic data including age, height, weight, and gender were also recorded on recruitment.

Within one hour of the hip injection, participants underwent the same process as before, performing the BRT three times and providing VAS scores. Additionally, operation notes and electronic medical records for each participant were reviewed to document the steroid dosage used and the indication for the hip injection.

The brake response test was conducted using the Brake Response Time Monitor (Delta Integration, Lancaster, PA, USA Model No 203B-01) (see Figure 2). The use of this method has been validated by previous studies^{8,9}. Participants were seated in an upright chair opposite a light box and pedals were positioned on the floor in front of the patient. Patients were instructed to press on the accelerator to react to the light box changing from green to red by pressing the brake pedal as quickly as possible. The machine recorded the time elapsed between the stimulus and the participant's response in seconds (s).



Figure 1. The brake response time monitor (Delta Integration INC., Lancaster, PA, USA Model No 203B-01)

Data collected, including pre- and post-operation VAS scores and BRTs, demographic information, and steroid dosage, were entered into an Microsoft Excel spreadsheet for analysis. Descriptive statistics such as means, standard deviations, and frequencies were calculated for demographic variables and outcome measures. Paired T-tests were used to compare continuous data. Statistical significance was set at $p < 0.05$.

This study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki¹⁰. Informed consent was obtained from all participants, and measures were taken to ensure participant confidentiality and privacy. Approval for study was obtained from the ethics committee of National Orthopaedic Hospital Cappagh.

Results

Patient demographics

55 patients (64 hips) were recruited for this study, with a mean age of 61.60 ± 14.63 years. The majority of participants were female (78.2%). The mean body mass index was 29.40 ± 5.93 kg/m². The average pre-injection VAS score was 4.94 ± 3.16 indicating a moderate level of pain reported by participants. Injection types varied, with 27 receiving intra-articular (IA) and 37 receiving greater trochanteric (GT) injections, with the most common indication being trochanteric bursitis (52.5%). Regarding laterality, 36 injections were performed on the right side while 28 injections were performed on the left side.

Clinical Outcomes

Overall, there was no significant difference in the mean pre- and post-injection braking time (0.83 ± 0.31 vs 0.84 ± 0.276 s, $p = 0.856$). Among IA injections, the difference in mean pre- and post-injection BRT was also insignificant (0.802 ± 0.235 vs 0.808 ± 0.188 , $p = 0.929$). Similarly, among GT injections the comparison did not yield a significant difference (0.85 ± 0.357 vs 0.862 ± 0.325 s, $p = 0.883$). There was a significant difference in the pre- and post-injection VAS score, with post-injection being significantly lower (4.94 ± 3.16 vs 3.52 ± 2.77 , $p = 0.0243$).

Discussion

To our knowledge, this is the first study to assess driving function post- intra-articular or greater trochanteric injection of the hip. Brake response time is a common and validated

metric in assessing driving ability by scientists and in studies investigating driving function after lower-limb procedures^{7,9,11–13}.

For our primary outcome, we found an overall mean post-hip injection BRT of 0.83 seconds, which is well within the recommended safe BRT of 1.25 seconds¹⁴. The results from our study demonstrated that patients' braking ability is unaffected after receiving their hip injection. This is consistent with the findings in the current literature that explored the impact of BRT after lower limb injections. In a prospective observational study of 45 patients, Cassidy et al. found no difference in BRT following intra-articular injections of the knee⁶. Talusan et al. also found in their study of 37 patients, no significant change in brake response after image-guided injections of the foot and ankle¹³. Given its substantial role in weight-bearing and movement coordination during movement, our examination of the hip joint specifically, is a strong indicator to its role in driving mechanisms¹⁵. Our study also showed a significant decrease in VAS pain scores following their injection, indicating a potential for an improved driving experience and further supporting the notion that patients should be allowed to drive without time restriction.

Demonstrating unaffected BRT following hip injections, has significant implications for current guidelines. Currently, in the USA, the National Review Practices for Driver Licensing provides recommendations for returning to driving following orthopaedic surgeries. However, there remains to be any standard guidelines published on driving after minimally invasive procedures such as intra-articular or greater trochanteric injections. Regarding returning to driving post orthopaedic injury/surgery, some institutions advise patients not to drive for 24 hours post-injection, based on the assumption that their driving function may be impaired. Our data challenges this recommendation, suggesting that patients' ability to respond appropriately in driving scenarios is not compromised by hip injections¹⁶. This evidence supports a revaluation of these guidelines, potentially allowing patients to drive immediately following their injections.

Revising these guidelines could yield several benefits for stakeholders. Patients would avoid the logistical and economic challenges of arranging transportation to and from the clinic¹⁷. This could lead to less appointment rescheduling and cancellations, as patients would not need to rely on others for rides. Previous studies have shown that patient no-shows cost healthcare systems a substantial amount of money due to unused clinical space, equipment, and staff time^{17–19}. Additionally, missed appointments can lead to complications of chronic conditions, increased hospital readmissions, and disruption of continuity of care^{20–22}. Thus, lifting the transportation barrier for hip injections can mitigate these severe drawbacks. In a retrospective cohort study of 4,216 patients in orthopaedic outpatient departments, Rane et al. found that increased wait times significantly increased the odds of satisfaction²³. To combat this, eliminating the driving restriction prolonged discharge times can be mitigated, as patients could leave the clinic independently without waiting for a ride, leading to reduced

wait times within the clinic. With patients' driving function being preserved, this change can increase overall healthcare efficiency and improve patient experience.

While these findings have the potential to change current practice, it is important to also note the limitations of this study. Firstly, it is important to acknowledge that driving is a complex mechanism impacted by several other factors influencing it that were not analysed in this study. Although BRT is a validated metric to evaluate driving safety, unexplored factors such as sensorimotor coordination, upper-limb motor function, and cognitive status can also affect driving function²⁴. Another limitation of this study is the single point of follow-up for BRT assessment post-injection. The study could be strengthened if multiple follow-up periods were used to assess the longer term effects on BRT, offering a more comprehensive evaluation of driving function. We also acknowledge that a portion of patients in our study were assessed for BRT on the left limb which may be contradictory as standard braking mechanisms are performed with the right limb. However, we argue that in assessing the BRT post-injection, our objective was to also examine the overall mobility of the lower limb which can be applied to driving function regardless of which side patients brake with.

The strength of this study lies in its rigorous methodology including its use of a validated measure of driving function, multiple measurements of BRT, and relatively large sample size obtained. The number of patients in this study was larger than several previous studies on the topic, indicating an improvement in statistical power^{4,6,25}. This study can serve as a call for future research with multiple follow-up points and potentially more sensitive measures to provide a more comprehensive understanding of driving safety following hip injections.

To conclude, brake response times did not significantly differ pre- and post- intra-articular and greater trochanteric injections of the hip. However, we acknowledge that BRT is not a sole determinant of driving function, and future studies should investigate other factors such as sensorimotor and upper limb function post-hip injection.

Number of Patients, (hips)	55 (64)
Age, y, mean $\pm$ SD	61.6 $\pm$ 14.63
Female; n (%)	43 (78.2)
BMI, mean $\pm$ SD	29.3 $\pm$ 5.74
Pre-injection VAS score, mean $\pm$ SD	4.94 $\pm$ 3.16
Injection type, IA : GT	27 IA : 37 GT
Laterality; R : L	36 R : 28 L

Table 2. Patient Demographics

	Overall	IA injections	GT injections
Preoperative BRT (s)	0.830 ± 0.31	0.802 ± 0.235	0.85 ± 0.357
Postoperative BRT (s)	0.840 ± 0.276	0.808 ± 0.188	0.862 ± 0.325
p-value	0.856	0.929	0.883
Preoperative VAS	4.94 ± 3.16	5.73 ± 3.47	4.39 ± 2.87
Postoperative VAS	3.52 ± 2.77	3.76 ± 3.06	3.35 ± 2.59
p-value	0.0243	0.0554	0.1424

Table 3. Combined BRT and VAS Outcomes

Declarations of Conflicts of Interest:

None declared.

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