ANNALS OF ORTHOPAEDICS, TRAUMA AND REHABILITATION Open Access

SCIENTIFIC LITERATURE

RESEARCH ARTICLE

Foot and Ankle Joints Intra Articular Injection Accuracy; without Image Guidance

Bilal Muhammad*, Johal Karan and Malik Ahmad

Buckinghamshire healthcare NHS Trust, UK

ARTICLE INFO

Article history:
Received: 04 September 2017
Accepted: 06 October 2017
Published: 16 October 2017

Keywords:
Foot joints;
Ankle joint;
Intra-articular injections

Citation this article: Muhammad B, Karan J, Ahmad M. Foot and Ankle Joints Intra Articular Injection Accuracy; without Image Guidance. Ann Orthop Trauma Rehabil. 2017; 1(2):116.

Correspondence:
Dr. Bilal Muhammad, Buckinghamshire healthcare NHS Trust, Queen Alexandra Road, High Wycombe, HP112TT,
Tel: 00447523006309,
Email: bilalm@doctors.org.uk

ABSTRACT

Introduction: Intra-articular injections form an integral part of diagnostic and therapeutic tools in Orthopaedics. Intra-articular injections have traditionally been performed without any imaging support, guided only by anatomic landmarks. This study was performed to assess the accuracy of intra-articular foot and ankle injections without fluoroscopy guidance.

Aim and objectives: To measure the accuracy of foot and ankle joints injections without the help of intraoperative fluoroscopy.

Methodology: A prospective case series of 53 patients and 83 joints performed at our institution from 2016-2017. Data was collected on a structured proforma for all the patients and analysed.

Results: There were total of 83 intra-articular injections performed on 53 patients. Successful joint injection was achieved in 54 (65%) joints using anatomical landmarks resulting in radiographic evidence of intra-articular radio-opaque dye infiltration. We performed all these injections in theatre under light sedation. The most successful joint injection was the ankle joint 93% (n=14) accuracy and the naviculocuneiform joint being the most inaccurate, with only one successful joint puncture (33%) out of three.

Conclusion: Our study demonstrated satisfactory result for Ankle joint injection (93%) but poor intra-articular injection using surface anatomical landmarks alone in the smaller foot joints. There is a role for routine ankle injection performed in clinical setting without image guidance to reduce the burden on theatre lists. However, careful patient selection is paramount for successful results. We recommend the use of fluoroscopy particularly for small joint injections of the foot.

Introduction

Intra-articular injections form an integral part of diagnostic and therapeutic tools in orthopaedic patient management and are particularly useful in foot and ankle cases, where a number of joints with composite movements make for a complex clinical and anatomical picture.

Intra-articular corticosteroid injections should be considered as an adjunct to core treatments for the relief of moderate to severe pain in people with osteoarthritis [1]. Additionally intra-articular injection with corticosteroids have demonstrated superior efficacy to systemic use in rheumatoid patients. The

intra-articular approach showed better results in terms of local inflammatory variables and improvement estimations by the patients and physicians [2].

Corticosteroid injections are a safe and effective option for a variety of foot and ankle conditions reducing the need for surgery and are particularly effective for the treatment of ankle soft tissue impingement [3]. Steroid injections have also demonstrated efficacy and cost-effectiveness for patients with soft tissue foot and ankle conditions and have traditionally been performed without any imaging support, guided only by anatomic landmarks [4,5]. Non-image guided injections increases the potential for inaccurate placement, there by jeopardizing the diagnostic and therapeutic efficacy [6,7]. There is also increase risk of adverse effects [8,9]. The use of imaging modalities such as ultrasound or intraoperative fluoroscopy, with or without the use of radio-opaque dye may significantly improve injection accuracy [10-13].

Cadaveric studies have shown injection of both ankle and subtalar joints without ultrasound guidance were 100% accurate in 14 cadaveric specimens. However, Tarsometatarsal (TMT) joint injection was much less accurate without image guidance [14]. Another cadaveric study, however, showed ankle injection accuracy of 78% using an anteromedial approach and 86% using an anterolateral approach [15].

To our knowledge there is no study assessing the accuracy of injections in all joints of the foot and ankle using surface anatomy. We performed this study to look at the accuracy of intra articular foot and ankle injections without intraoperative fluoroscopy.

Material and Methods

A prospective case series of 53 patients and 83 joint injections performed in a District General Hospital to measure the accuracy of intra articular injections without the help of intraoperative fluoroscopy. The procedure was performed by either a consultant, post CCT Fellow or specialist registrar. Only foot and ankle injections were included in the study. A written informed consent was obtained from all the patients undergoing injections and there were no alterations in existing treatment protocols. The study was a service evaluation and approval was obtained from the hospital's Research and Audit department.

Patients, who received intra articular injection as part of another procedure such as ankle stability assessment, were not included in the study.

In each case, an initial joint injection was made using surface marking of anatomical landmarks and then intraoperative fluoroscopy was used to confirm the position before injecting any steroid into the joint. If it was deemed that the needle was not in an appropriate position then this was considered a failure. If the needle positioning was felt to be in the correct joint, then radio-opaque dye was instilled. If the dye did not accumulate in the joint, this was also considered a failure. By this method, dye was not injected blindly which could compromise the outline of the joint and make further injections difficult.

Results

There were a total of 83 intra-articular injections performed on 53 patients. Overall successful joint injection was achieved in 54 (65%) joints using anatomical landmarks resulting in radiographic evidence of intra-articular radio-opaque dye infiltration. All unsuccessful injections n=29 (35%) were subsequently completed using intraoperative fluoroscopy. We performed these injections in theatre under light sedation.

The most successful joint injection was in the ankle joint 93% (n=14) using surface anatomy alone was achieved. Ten ankle injections were undertaken using an anteromedial approach and five utilized the anterolateral approach. One missed injection was using the anterolateral approach.

Every other joint injected had lower accuracy rates with the naviculocuneiform joint being the most inaccurate, with only one successful joint puncture out of three. In order of highest accuracy other joints injected (Table 1) has variable success rates: metatarsophalangeal (hallux) 75% (n= 6), subtalar and interphalangeal (hallux) 67% each, Lesser metatarsophalangel (lesser) 63% (n=5) and

talonavicular and tarsometatarsal Joint 50% each (Figure 1).

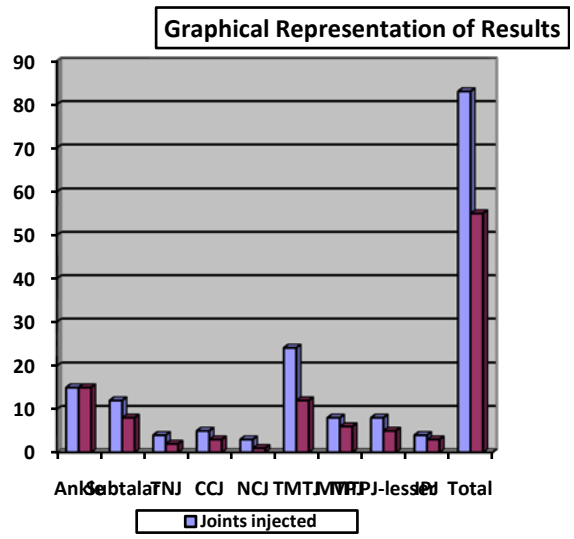

Figure 1: Graphical Representation of Results.

Table 1: Analysis of joints injected.

Joint Injected	No.	Successful joint puncture	Accuracy (%)
Ankle	15	14	93
Subtalar	12	8	67
Talonavicular	4	2	50
Calcaneocuboid	5	3	60
Naviculocuneiform	3	1	33
Tarsometatarsal	24	12	50
Metatarsophalangeal (hallux)	8	6	75
Metatarsophalangel (lesser)	8	5	63
Interphalangeal (hallux)	4	3	67
TOTAL	83	54	65

Discussion

The findings demonstrated that accuracy of the joint puncture using surface anatomy was highly variable for foot and ankle joints. Based on this study the ankle joint could be reliably injected by using surface anatomy, with 93% accuracy demonstrated. One Study showed approximately 80% accuracy in ankle injections without image guidance [15]. Variation in the result is also dependent on technique and experience of the surgeon.

Intra-articular injections for the large joints as Knee is always performed in the clinical setting and a large recent study had shown that intra-articular knee joint injection was only 89% accurate using similar techniques to our study [16]. This shows a comparable success rate for ankle and knee joint injections. Additionally, blind intra-articular injections have been shown to be safe and accurate when performed by trained professionals in a large study involving 232 patients with rheumatoid arthritis. Significant improvement was seen in the pain at rest, for edema and morning stiffness [17].

Intra-articular injections performed in theatres cause a considerable burden on waiting lists and can therefore have a significant financial impact. Whilst this study does not attempt to quantify this expense, but based on the above discussion, large joints such as Ankle with 93% accuracy, does give us the confidence to safely perform intra articular ankle joint injections in the clinical setting in selected patient population.

Accuracy rates started dropping around the hind foot, mid foot and forefoot joints due to the complex anatomy which indicates that small joint injections in foot require image guidance to achieve higher diagnostic and therapeutic efficacy.

We found an accuracy of 67% for subtalar joint puncture, with 4 attempts deemed unsuccessful. In all of these 4 unsuccessful attempts dye appeared to pool around the sinus tarsi but the needle must be repositioned to enter the posterior facet of the subtalar joint. It has been shown that a sinus tarsi approach to the subtalar joint can reliably infiltrate into the posterior subtalar joint [18]. Cadaveric study demonstrated 91% accuracy for subtalar injection using the posterolateral approach and 68% accuracy using the anterolateral approach [19]. In our study all subtalar injections were undertaken using the posterolateral approach with 67% success rate without image guidance for the sake of this study but with image help all injections were successfully injected. In comparison, a cadaveric study has demonstrated 90% accuracy of accessing the subtalar joint using ultrasound guidance [20].

Chopart and Lisfranc joint puncture was routinely unreliable and this is in keeping with other studies [14]. Injections into the Metatarsophalangeal (MTP) joints were more accurate in the 1st MTP joint (80%) than the lesser MTP joints (50%) which one would expect given the relative sizes and surface anatomical landmarks.

Conclusion

In conclusion, this study demonstrates satisfactory result for ankle joint (93%) but considerable inaccuracy of joint puncture using surface anatomical landmarks alone in the smaller foot joints. Larger studies have shown relatively comparable rates of ankle and knee joint penetration using surface anatomy without image guidance and we therefore suggest a role for routine ankle injection to be performed in clinical setting without image guidance to reduce the burden of these injections on theatre lists. However, the impact of misplaced injections should not be underestimated and careful patient selection is paramount for successful results.

Small joints of foot have variable and low success rate and we recommend use of image guidance for higher diagnostic and therapeutic success in these complex areas. A misplaced injection jeopardizes the outcome and can lead to misinterpretation of results leading to inappropriate management of patients. Further studies with controlled trials are needed to validate these findings [21].

References

1. NICE. (2014). Intra-articular corticosteroid injections should be considered as an adjunct to core treatments for the relief of moderate to severe pain in people with osteoarthritis. NICE Guide to Osteoarthritis: care and management Clinical guideline [CG177].

2. Konai MS, Vilar Furtado RN, Dos Santos MF, Natour J. (2009). Monoarticular corticosteroid injection versus systemic administration in the treatment of rheumatoid arthritis patients: a randomized double-blind controlled study. Clin Exp Rheumatol. 27: 214-221.

3. Grice J, Marsland D, Smith G, Calder J. (2016). Efficacy of Foot and Ankle Corticosteroid Injections. Foot Ankle Int. 38: 8-13

4. Thomson CE, Martin DJ, McMillan D, Edwards RT, Russell D, et al. (2013). Methylprednisolone injections for the treatment of Morton neuroma. J Bone Joint Surg Am. 95: 790-798.

5. Eleni E, Drakonaki, Gina M Allen, Roland Watura. (2016). Ultrasound-guided intervention in the ankle and foot Br J Radiol. 89: 20150577

6. Haghighat S, Taheri P, Banimehdi M, Taghavi A. (2015). Effectiveness of Blind & Ultrasound Guided Corticosteroid Injection in Impingement Syndrome. Glob J Health Sci. 8: 179-184.

7. Soh E, Li W, Ong KO, Chen W, Bautista D. (2011). Image-guided versus blind corticosteroid injections in adults with shoulder pain: a systematic review. BMC Musculoskelet Disord. 12: 137.

8. Brinks A, Koes BW, Volkers AC, Verhaar JA, Bierma-Zeinstra SM. (2010). Adverse effects of extra-articular corticosteroid injections: a systematic review. BMC Musculoskelet Disord. 11: 206.

9. Jain K, Asad M, Joshi Y, Syed A. (2015). Tibialis anterior tendon rupture as a complication of first tarsometatarsal joint steroid injection: A case report and review of literature. Foot (Edinb). 25: 179-181.

10. Bisbinas I, Belthur M, Said HG, Green M, Learmonth DJ. (2006). Accuracy of needle placement in ACJ injections. Knee Surg Sports Traumatol Arthrosc. 14: 762-765.

11. Ağırman M, Leblebicier MA, Durmuş O, Saral I, Gunduz OH. (2016). Should we continue to administer blind shoulder injections? Eklem Hastalik Cerrahisi. 27: 29-33.

12. Sethi PM, Kingston S, Elattrache N. (2005). Accuracy of anterior intra-articular injection of the glenohumeral joint: Arthroscopy. 21: 77-80.

13. Soneji N, Peng PW. (2016). Ultrasound-Guided Interventional Procedures in Pain Medicine: A Review of Anatomy, Sonoanatomy, and Procedures: Part VI: Ankle Joint. Reg Anesth Pain Med. 41: 99-116.

14. Khosla S, Thiele R, Baumhauer JF. (2009). Ultrasound guidance for intra-articular injections of the foot and ankle. Foot Ankle Int. 30: 886-890.

15. Heidari N, Pichler W, Grechenig S, Grechenig W, Weinberg AM. (2010). Does the anteromedial or anterolateral approach alter the rate of joint puncture in injection of the ankle? A cadaver study. J Bone Joint Surg Br. 92: 176-178.

16. Telikicherla M, Kamath SU. (2016). Accuracy of Needle Placement into the Intra-Articular Space of the

Knee in Osteoarthritis Patients for Viscosupplementation. J Clin Diagn Res. 10: RC15-17.

17. Lopes RV, Furtado RN, Parmigiani L, Rosenfeld A, Fernandes AR, et al. (2008). Accuracy of intra-articular injections in peripheral joints performed blindly in patients with rheumatoid arthritis. Rheumatology (Oxford). 47: 1792-1794.

18. Smith J, Maida E, Murthy NS, Kissin EY, Jacobson JA. (2015). Sonographically guided posterior subtalar joint injections via the sinus tarsi approach. J Ultrasound Med. 34: 83-93.

19. Kraus T, Heidari N, Borbas P, Clement H, Grechenig W, et al. (2011). Accuracy of anterolateral versus posterolateral subtalar injection. Arch Orthop Trauma Surg. 131: 759-763.

20. Reach JS, Easley ME, Chuckpaiwong B, Nunley JA. (2009). Accuracy of ultrasound guided injections in the foot and ankle. Foot Ankle Int. 30: 239-242.

21. Partington PF, Broome GH. (1998). Diagnostic injection around the shoulder: hit and miss? A cadaveric study of injection accuracy. J Shoulder Elbow Surg. 7: 147-150.