THE RESPONSE TO INTRA-ARTICULAR STEROID INJECTIONS IN PATIENTS WITH OSTEOARTHRITIS OF THE KNEE: SONOGRAPHIC VERSUS PALPATION TECHNIQUE

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Abstract

Background: Osteoarthritis is the most common chronic joint disease globally, intra articular steroid injection (IASI) is an option of treatment but has a huge variation in the response and duration of response. One of the reasons proposed for this variation is the extra-articular deposition of the steroid. This study is aimed at determining if there is any difference in response from traditional palpation-guided technique from the sonographic-guided technique.

Method: Fifty-four patients aged 30 to 80 years who have been diagnosed of osteoarthritis using American College of Rheumatology criteria, and have met the inclusion criteria were enrolled in the study. They were randomly divided into two cohort groups and had intra articular steroid injections into the knee either by palpation or sonographic-guided technique.

Results: The median age of the participants was 53.5 ± 10.1 years, there was a predominance of females, there was no significant difference between the sonography group and the traditional palpation technique group except in alcohol consumption with *p-value* of 0.025.

In this study, palpation-guided methods responders are similar with the relative value of responders for the sonographic-guided method, 76.9% and 81.9%, respectively in 2 weeks using WOMAC score and 100% each using the VAS score. The WOMAC score in the group that had IASI under sonography had better pain reduction as seen in Figure 1, but the difference in response between the two groups was not statistically different.

Conclusion: In conclusion, palpation-guided intra articular steroid injection response is like the response from sonographic-guided intra articular steroid injection.

Introduction

Osteoarthritis (OA) is the most common chronic joint disease worldwide. Intra articular steroid injection (IASI) has been widely used in the management of symptomatic knee OA, the most affected joints.[1] There is evidence of short-term benefit of IASI to provide pain relief for up to 3 to 4 weeks. However, there is a huge variation in the response to intra articular steroid injection and there is a great variation in the duration of response. One of the reasons proposed for this variation is the extra-articular deposition of the steroid.[2]

Intra-articular steroid injections have been performed using anatomical landmarks to identify the correct trajectory for needle placement. However, different anatomical-guided injection techniques have yielded inconsistent intra-articular needle positioning due, in large part, to the fact that variations in anatomy are common and physician cannot directly visualize the area of interest. Incorrect needle placement has been partially

attributed to variable clinical outcomes seen in the variation in response to the effect of intra articular steroid injection in the management of osteoarthritis.[3-6] Furthermore, inaccurate corticosteroid injections in the knee, for example, may result in post-injection pain, crystal synovitis, hemarthrosis, and joint sepsis, as well as systemic effects, such as fluid retention or exacerbation of hypertension or diabetes mellitus.[7] It is therefore, important to identify methods or techniques which will aid in correct needle placement during these procedures.

Accuracy of intra-articular (IA) placement of the needle by palpating surface anatomy by skilled orthopedic surgeons and rheumatologists, are dismal, with an unintended non-intra-articular injection rate as high as 50% – 60%.[3,5,8,9] In contrast, sonographic image guidance routinely improves the accuracy of IA positioning of the needle tip and permits intra-articular injections with 96 – 100% accuracy.[10,11] However, there is limited evidence that routine use of sonographic needle guidance causes a clinically significant improvement in the outcome relative to traditional palpation-guided methods.[12] This study aims to see if there is any difference between the response to intra-articular steroid injection using the palpation technique to the sonographic-guidance technique.

Materials and Methods

The study was done at Jos University Teaching Hospital, Jos, Plateau state. Informed consent was taken from the patients at the time of enrolment, and the study was approved by the ethical committee of Jos University Teaching Hospital with reference number JUTH/DCS/IREC/127/XXX1994. Fifty-four patients visiting the Orthopaedic clinic, Jos University Teaching Hospital, Jos, Plateau state from October 2019 to October 2020, were included in the study by simple convenient sampling. The inclusion criteria included patient ranging from 30 to 80 years of age, diagnosed cases of OA based on American College of Rheumatology (ACR) clinical classification criterion with or without radiological support and who were not responding to conventional treatment of OA such as NSAIDs, acetaminophen and physiotherapy for more than 3 months. Exclusion criteria included known hypersensitivity to Depo Medrol 40 mg and 2% Lidocaine. All patients were recruited voluntarily into the study after obtaining a written informed consent. The participants were randomly assigned to either a conventional injection by anatomic palpation or to sonographic needle guidance group by balloting.

Using the palpation technique, the superior lateral aspect of the patella was palpated one finger breadth above and one finger breadth lateral to this site with the patient supine on the table and the knee extended. Methylated spirit was used to clean the skin. A 10-mL syringe was connected to a 21-gauge, 1-inch needle. Lidocaine (Xylocaine) was injected into the skin, tilting the needle 45 degrees below the patella and 45 degrees distally into the knee. Aspiration was carried out after the needle has been inserted about one inch to 1¼ inches, and the syringe filled with fluid. Arthrocentesis was facilitated by applying pressure to the patella or the opposing side of the joint with the non-dominant hand. One mL of methylprednisolone (Depo-Medrol, 40 mg per mL) was combined with three to five mL of 2 percent lidocaine. The needle and syringe were removed following the injection of the medication. A bandage was placed over the needle puncture site after the skin had been thoroughly cleaned.

The sonographic guided technique was performed using the straight leg lateral suprapatellar bursa (superolateral) approach. Physical examination performed before the procedure confirmed the existence of suprapatellar bursal distention. To image the swollen suprapatellar bursa, the knee was extended, and the Ultrasound (US) probe was positioned transversely over the quadriceps tendon (Figure 3). A single needle was used for anesthesia, arthrocentesis, and intra-articular injection; first a syringe was used to anesthetize the synovial membrane and completely aspirate the effusion; and then one mL of methylprednisolone (Depo-Medrol, 40 mg per mL) was combined with three to five mL of 2 percent lidocaine. The needle and syringe are removed following the injection of the medication. A bandage was placed over the needle puncture site after the skin had been thoroughly cleaned.

Prior to administration of intra-articular steroid injection (IASI) visual analogue scale (VAS) score, Western Ontario, and McMaster Universities Osteoarthritis Index (WOMAC) score and baseline parameters were measured for each subject. Under proper aseptic conditions 40 mg of methylprednisolone acetate mixed with 2% lignocaine was injected using either technique. Immediately after the injection patients were advised to observe 24-hour bed rest at home. VAS and WOMAC were calculated at 2 weeks, 4 weeks, and 3 months post IASI administration. Each participant was followed up (monthly phone calls and during clinic visits) for 3 months and documenting health-related outcomes during this period.

Prior to enrollment, full clinical history was obtained, and thorough physical examination conducted on the subjects. Relevant medical information obtained (age, sex, weight, height,) were documented. Each patient was followed up for 3 months after the intraarticular injection. Patients were required to come for follow up in 2 weeks during which thorough clinical examination was done and WOMAC and VAS scores obtained. Those absent at the first visit were called personally on phone. Same assessment was done at 6 weeks and at 3 months.

Data were serialized, completed, and double checked for completeness and then entered into Excel sheet which was subsequently exported into Statistical Package for the Social Sciences version 23.0 for analysis. The WOMAC and VAS scores were transformed to a dichotomous variable of responders and non-responders. Good response (responders) is when there is 50% reduction in pain either using the WOMAC or the VAS while poor response (non-responders) is less than 50% reduction in pain using the WOMAC or the VAS. Univariate analysis of socio-demographic characteristics of the patient were done, and the basic descriptive statistics were presented in frequency and percentages. Quantitative variables were described using mean and standard deviation while qualitative variables were described using frequencies, proportions, charts, and tables. Wilcoxon ranked test was used to assess the difference in pain response between intra-articular steroid injection under sonographic-guidance group to the conventional by palpation technique group.

Results

A total of 48 patients who met the criteria were recruited for the study and were randomly divided into two groups, the first group which had intra-articular steroid injection using palpation technique had 26 patients, while the second group which had injection under US-guidance had 22 patients,

4 patients from this group were lost to follow up. About 95% of the patients were above the age of 40 years. There was a predominance of females in the two cohort groups with a total male to female ratio of 3:7 this also support the fact that the disease is more in women.[1] 54.2% of the combine group are obese and only 12.5% have normal body mass index.

Socio-demographic characteristics

Table: 1 Demographic characteristics of patient in the two cohort groups

Characteristics	**Study group**		**Total**	**χ2**	**P-value**
	Palpation n=26 f (%)	**Sonography n=22 f (%)**			
Age (years)					0.523[F]
<40	2 (100.0)	0 (0.0)	2 (4.2)		
40-59	16 (50.0)	16 (50.0)	32 (66.7)		
60-79	8 (57.1)	6 (42.9)	14 (29.2)		
Mean ± SD	53.6 ± 11.8	53.4 ± 7.8	53.5 ± 10.1		
Sex				0.071	0.791
Male	8 (57.1)	6 (42.9)	14 (29.2)		
Female	18(52.9)	16 (47.8)	34 (70.8)		
Education					0.025[F]
Primary	5 (29.4)	12 (70.6)	17 (35.4)		
Secondary	13 (61.9)	8 (38.1)	21 (43.8)		
Higher	8 (80.0)	2 (20.0)	10 (20.4)		
Occupation					0.283[F]
Business	2 (50.0)	2 (50.0)	4 (8.3)		
Civil servant	9 (60.0)	6 (40.0)	15 (31.3)		
Housewife	5 (33.3)	10 (66.7)	15 (31.3)		
Lecturing	2 (100.0)	0 (0.0)	2 (4.2)		
Trading	8 (66.7)	4 (33.3)	12 (25.0)		
BMI					0.511[F]
Normal	2 (33.3)	4 (66.7)	6 (12.5)		
Overweight	10 (62.5)	6 (37.5)	16 (33.3)		
Obese	14 (53.8)	12 (46.2)	24 (54.2)		
Systemic Hypertension				0.336	0.526
Yes	12 (50.0)	12 (50.0))	24 (50.0)		
No	14 (58.3)	10 (41.7)	24 (50.0)		
Alcohol				5.035	0.025*
Yes	6 (33.3)	12 (66.7)	18 (37.5)		
No	20 (66.7)	10 (33.3)	30 (62.5)		
Smoking					*0.827[Y]*
Yes	4 (66.7)	2 (33.3)	6 (12.5)		
No	22 (52.4)	20 (47.6)	42 (87.5)		

F=fishers Exact *Y=Yates Correction*

There is no significant difference between the sonography group and the conventional palpation technique group except in alcohol consumption p-value of 0.025.

Table 2: Outcome of intra-articular steroid injections based on study group

Outcome	Study group		Total	χ2	P-value
	Palpation n=26 f (%)	Sonography n=22 f (%)			
WOMAC					
2 weeks					0.953[Y]
Poor	6 (23.1)	4 (18.2)	10 (21.6)		
Good	20 (76.9)	18 (81.8)	38 (78.4)		
6 weeks					0.709[Y]
Poor	7 (26.9)	4 (18.2)	11 (22.9)		
Good	19 (73.1)	18 (81.8)	37 (77.1)		
3 months				0.715	0.398
Poor	15 (57.5)	10 (45.5)	25 (52.1)		
Good	11 (42.3)	12 (54.5)	23 (47.9)		
VAS					
2weeks					
Poor	0 (0.0)	0 (0.0)	0 (0.0)		
Good	26 (100.0)	22 (100.0)	48 (100.0)		
6 weeks					0.151[Y]
Poor	7 (26.9)	2 (9.1)	9 (18.8)		
Good	19 (73.1)	20 (90.9)	39 (81.3)		
3 months				0.900	0.343
Poor	13 (50.0)	8 (36.4)	21 (43.8)		
Good	13 (50.0)	14 (63.6)	20 (56.3)		

[Y]=*Yates Correction*

There is no statistical difference between the study group.

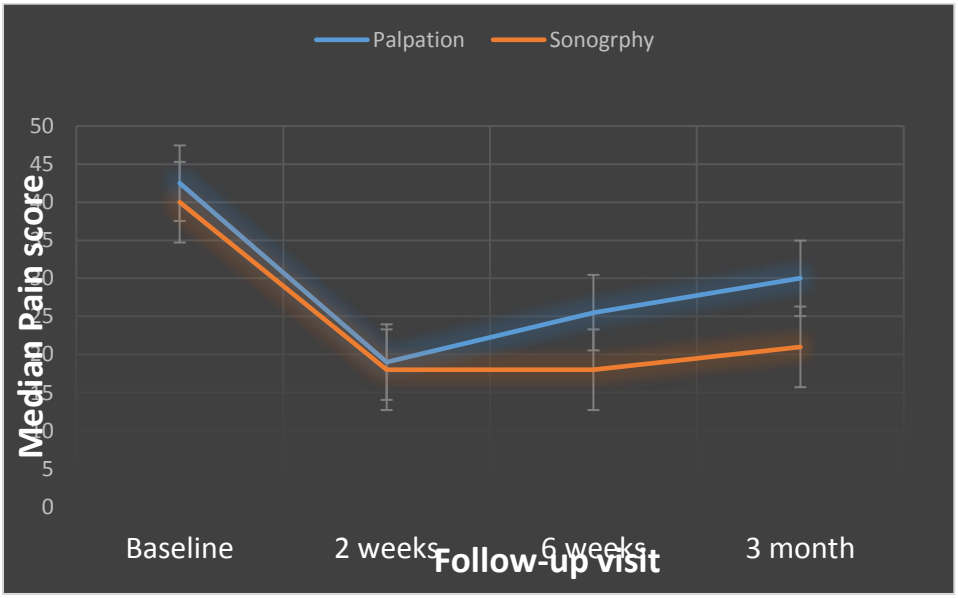

Figure 1: A line graph showing median WOMAC Score at each visit

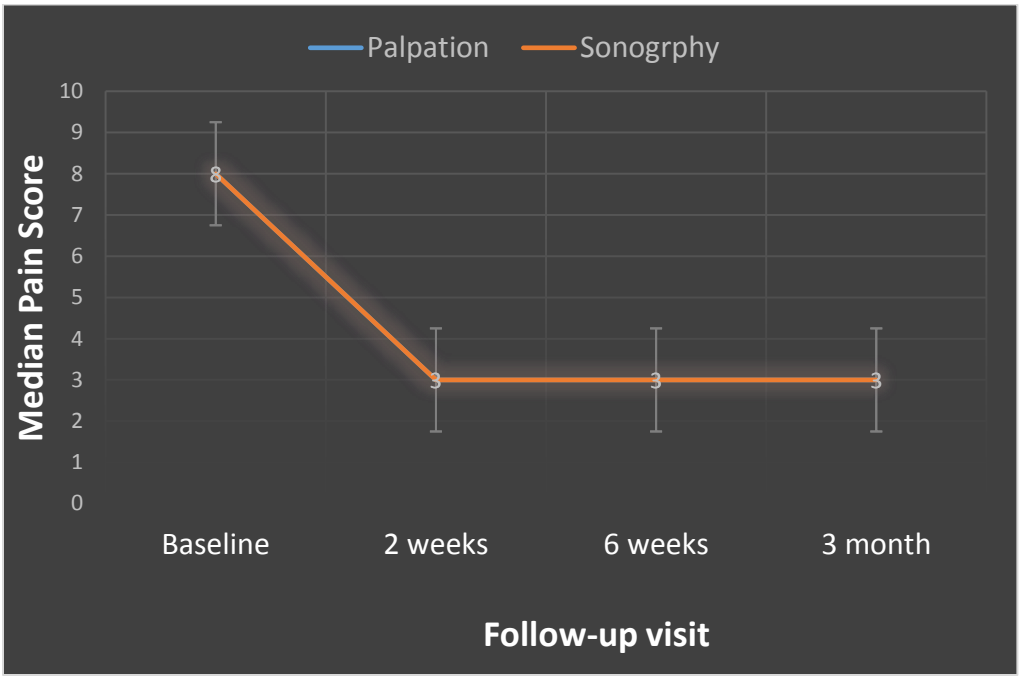

Figure2: A line graph showing median VAS Score at each visit

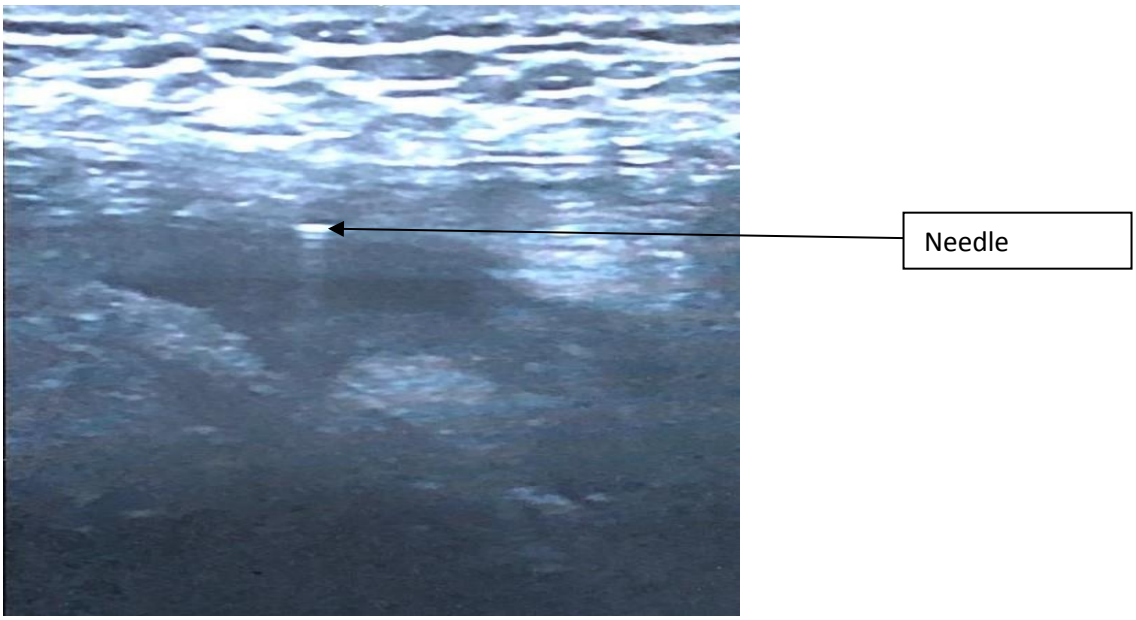

Figure 3: Ultrasound-guided needle introduction. This sonographic image shows the needle introduced into the effusion of the suprapatellar bursa from the superolateral portal with a straight positioning.

Discussion

Sonography is becoming more common among physicians who treat musculoskeletal diseases, however, questions about its wisdom and scientific explanation in clinical use have persisted as regards its daily use for all intra-articular steroid injection. There is a growing support for the widespread use of ultrasonography in outpatient musculoskeletal medicine.[8,13,14] The results from the current palpation-guided needle method is as comparable to sonographic-guided needle method, therefore, raising a reasonable level of concern regarding rising costs for ultrasonography guided injection.[15] As a result, traditional palpation-guided treatment for IA injections is preferable for routine clinic procedure, and intra articular injection guided by sonography for non-responders, or patients with challenging anatomy such as deep joints, the hip, complex joints such as tarsal-metatarsal joints, facet joints and sacroiliac joints.[15-19] In this study, the responders of palpation-guided method are similar with the relative value of responders for the sonography-guided method,76.9% and 81.9%, respectively in 2 weeks using WOMAC score and 100% each using the VAS score.

However, on the other hand, there is a growing concern about the duration of response to intra articular steroid. The large variability seen in the extent and duration of response is thought to be because of extra-articular steroid injection. Since steroid when injected blindly by palpation technique as normally done in the clinic would be injected into the structures around the synovium, if true, this should account for the variability seen. It is believed that intra-articular steroid injection in the outpatient department should be under sonographic guidance. In a study where the accuracy of intra-articular steroid injection by palpation technique was assessed for 109 injections into a variety of joints, it was discovered that about 33% of the knee and ankle injections were extra-articular. The wrist injections were obviously extra-articular 50% of the times, and shoulder injections have been reported to be less accurate.[3] Following that, similar issues have been discovered in other studies when it comes to locating the needle precisely, with a failure incidence of 12% to 70% in the subacromial bursa.[3,8,9,19-21] Despite the extra-rticular implantation, the results of response from this study were satisfactory, implying that total precision of intra-articular injection is not necessary for a good clinical response. In this study of two cohort groups, one had injection blindly by clinical palpation method while the other group had injection under ultrasound guidance, we found no significant difference in the outcome measures between the two groups at 2 weeks, 6 weeks, and 3 months. Also, using the median pain score line graph, WOMAC score in the group that had IASI under sonography had better pain reduction as seen in figure 1 which is in keeping with the finding in other studies[5,22,23] where intra-articular injection under sonographic guidance gives better results. However, the difference between the groups in the outcome measures is not statistically significant.

Conclusion

In conclusion, we found there is no significant difference between the response from intra-articular steroid injection using the palpation technique compared to sonography guided intraarticular steroid injection.

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