Serial WOMAC Score Assessment after Radiofrequency Genicular Nerve Ablation or Intra-articular Botox in Osteoarthritic Patients

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Abstract:

Background and Aim: Chronic osteoarthritis is a disabling, progressive disease. Most of the measures have modest efficacy. Botulinum toxin is a promising modality owing to its potential anti-inflammatory actions. The study aimed to monitor the Western Ontario and McMaster Universities Arthritis Index (WOMAC) in the population with severe osteoarthritis; the secondary outcome included visual analogue scale (VAS) and possible complications.

Patients and Methods: Fifty-two patients diagnosed with osteoarthritis of the knee joints who fulfilled the revised ACR criteria 2016 were enrolled into two equally assigned groups. Group RF involved 26 patients who received fluoroscopically guided genicular nerve ablation, while the BX group involved intra-articular injection of botulinum toxin type A. All patients with OA knees presented with knee pain and were classified into stage 3 or 4 according to the Kellgren Lawrence classification. Previous Knee surgery, knee effusion, intra-articular knee injection in the preceding 3 months, or coagulopathy, systemic connective tissue disorder were excluded from the study.

Results: Regarding WOMAC for pain, at the 1st and 3rd months of treatment, patients who received Botox injection recorded significantly lower WOMAC scores for pain compared to patients who received Radio-frequency waves. WOMAC score for stiffness revealed a significant difference between the studied groups at 3rd and 6th months post-procedure. The Botox group recorded significantly lower WOMAC scores for stiffness than the radio-frequency group. Pre-treatment and 1-month values are comparable between the studied groups.

Conclusion: Intra-articular Botox was more impactful than radiofrequency ablation of the genicular nerves in the context of pain alleviation and stiffness improvement.

Keywords: Radiofrequency; Osteoarthritis; Genicular nerve ablation.

Introduction:

Osteoarthritis (OA) is the most common disease of joints in adults around the world. The prevalence of knee osteoarthritis is higher among 70- to 74-year-olds, rising as high as 40% **(1)**. The radiological demonstration of typical signs of knee osteoarthritis is not correlated with symptoms: Only about 15% of radiologically demonstrated knee osteoarthritis patients complain of knee pain **(2)**.

OA is the most common reason for total hip and knee replacement **(3)**. The rapid increase in the prevalence of this already common disease suggests that OA will have a growing impact on health care and public health systems in the future **(4-6)**.

Patients and Methods

Study Design

This prospective randomized double-blind controlled clinical trial was conducted at the Physical Medicine, Rheumatology, and Rehabilitation Department at Assiut University Hospitals from October 2019 to March 2020.

All patients signed informed consent. Assiut Faculty of Medicine approved the study with IRB: 17101615

Selection criteria

All patients with OA knees who presented with knee pain were classified into stage 3 or 4 according to the Kellgren Lawrence classification **(7)** were enrolled in the study. Previous Knee surgery, knee effusion, intra-articular knee injection in the preceding 3 months, or coagulopathy, systemic connective tissue disorder were excluded from the study.

Sample Size and Randomization

The total coverage sample technique was applied in the current study due to the paucity of cases that fulfilled the selection criteria. Fifty-two patients diagnosed with osteoarthritis of the knee joints fulfilled the revised ACR criteria 2016 **(8)** and were randomly enrolled into two equally assigned groups with simple randomization (1:1 ratio).

Serially numbered sealed opaque envelopes were used for allocations. After opening the sealed envelope, each patient was assigned a sequential number from a computer-generated randomization table and allotted to the proper group. Participants also received appropriate counseling prior to recruitment.

Group RF involved 26 patients who received fluoroscopically guided genicular nerve ablation, while the BX group involved intra-articular injection of botulinum toxin type A.

Methods

All eligible patients with knee osteoarthritis were subjected to full history taking and clinical evaluation.

Disease Activity Assessment

All patients were subjected to:

- Assessment of each knee's pain, stiffness, and physical function using the Western Ontario and McMaster University Osteoarthritis Index (WOMAC).
- Visual analogue pain score (VAS) (0-10 score, 0=no pain, 10= the worst imaginable pain, the patient chooses the number that best represents the intensity of their pain).

Intervention

Group I (Bx): was injected in one knee joint by intra-articular 100BoNT-A (Botox; Allergan Inc, Irvine, KY, USA) diluted with 2.5 ml preservative-free 0.9%saline solution. A single injection was given by an experienced rheumatology physician with the patients in the supine position, ultrasonographically guided. Using sterile ultrasound gel and a lateral approach, color Doppler ultrasound was used to identify the knee's articular cavity at the suprapatellar bursa level. A linear array musculoskeletal ultrasound probe with a frequency of 15 MHz was used.

The patient was placed supine on the fluoroscopy C-arm table in the pain clinic procedure room. An intravenous access was obtained, and the ultrasound monitoring (ECG electrode, non-invasive blood pressure cuff, pulse oximetry) was applied. A cushion was placed under the popliteal fossa to flex the knee to 15°.

Group II RF: This was conducted on the three genicular nerves (upper medial, upper lateral, and lower medial), but not on the lower lateral genicular nerves, to prevent injuring the common peroneal nerve at the fibular head. To avoid unintended motor nerve ablation, the nerve was tested for the absence of fasciculation on its corresponding lower limb area using a current of 2.0 V at 2Hz. Before beginning the RF, 2 ml of 2% lidocaine was injected (Neuro Therm TM, Morgan Automation LTD, Liss, UK); subsequently, the electrode was placed through the cannula, and the tip temperature was elevated to 80°C for 90 seconds.

Results

Table 1: demographic and clinical data between both studied groups (n=52)

Variable name	Botox injection (n=26)	Radio-frequency (n=26)	P value
Age (years)			0.2
• Mean ± SD	54.36 ± 7.49	57.19 ± 9.26	
• Median (range)	54 (41 – 70)	57 (40 – 73)	
History of chronic illness			0.7
• DM	5 (20.0)	5 (18.5)	
• HTN	11 (44.0)	12 (44.4)	
• Hyperlipidemia	2 (8.0)	2 (7.4)	
• Crystals	5 (20.0)	8 (29.6)	
• Other chronic diseases	2 (8.0)	0 (0.0)	
Side			0.3
• Unilateral	16 (64.0)	14 (51.9)	
• Bilateral	9 (36.0)	13 (48.1)	
Stage			0.6
• Stage 3	18 (72.0)	18 (66.7)	
• Stage 4	7 (28.0)	9 (33.3)	
Disease duration			0.1
• Mean ± SD	10.16 ± 5.38	13.59 ± 7.35	
• Median (range)	10 (2 – 25)	10 (3 – 25)	

Quantitative data are presented as mean ± SD and median (range), and qualitative data are presented as number (percentage). P-value is significant ≤0.05.

The demographic and clinical characteristics of the participants studied were comparable between the two groups, as shown in **Table 1.**

Table 2: WOMAC for pain during the study period.

WOMAC for pain	Botox injection (n=25)	Radio-frequency (n=27)	*P value*[1]
Before treatment			0.847
• Mean ± SD	15.60 ± 1.23	15.59 ± 0.89	
• Median (range)	16 (12 – 18)	16 (14 – 17)	
After 1st month			0.02*
• Mean ± SD	5.56 ± 2.96	13.04 ± 3.96	
• Median (range)	5 (2 – 15)	15 (3 – 17)	
After 3rd months			0.03*
• Mean ± SD	5.48 ± 2.89	9.44 ± 3.70	
• Median (range)	5 (3 – 15)	8 (3 – 16)	
After 6th months			0.774
• Mean ± SD	5.76 ± 2.96	7.22 ± 5.42	
• Median (range)	5 (3 – 15)	5 (2 – 16)	

Quantitative data are presented as mean ± SD and median (range). P-value is significant ≤0.05.

P-value: Comparing both studied groups

- At the 1st and 3rd months of treatment, patients who received Botox injection recorded significantly lower WOMAC score for pain than those who received Radio-frequency waves (p values = 0.02 and 0.03, respectively).
- After 6 months of treatment, no significant difference was observed between the two studied groups (P=0.774).

Table 3 WOMAC for stiffness during the study period

WOMAC for stiffness	Botox injection (n=25)	Radio-frequency (n=27)	*P value*
Before treatment			0.4
• Mean ± SD	6.88 ± 0.83	4.44 ± 2.26	
• Median (range)	7 (5 – 8)	5 (4 – 7)	
After 1st month			0.150
• Mean ± SD	2.56 ± 1.42	3.81 ± 2.45	
• Median (range)	3 (0 – 6)	3 (1 – 8)	
After 3rd months			0.02*
• Mean ± SD	2.60 ± 1.35	6.04 ± 2.05	
• Median (range)	3 (1 – 6)	7 (1 – 8)	
After 6th months			0.04*
• Mean ± SD	2.80 ± 1.41	6.15 ± 2.05	
• Median (range)	3 (1 – 6)	7 (1 – 8)	

Quantitative data are presented as mean ± SD and median (range). P-value is significant ≤0.05.
P-value: Comparing both studied groups

Significant differences between the studied groups were recorded at the 3rd and 6th months post-procedure. The Botox group recorded significantly lower WOMAC score for stiffness compared to the Radio-frequency group (p values 0.02 and 0.04, respectively). Pre-treatment and 1-month values are comparable between the studied groups.

Table 4 WOMAC "Total" during the study period

WOMAC - Total	Botox injection (n=25)	Radio-frequency (n=27)	*P value*
Before treatment			0.247
• Mean ± SD	74.24 ± 5.70	72.22 ± 4.14	
• Median (range)	73 (66 – 85)	71 (74 – 81)	
After 1st month			0.01*
• Mean ± SD	26.68 ± 15.24	58.96 ± 20.42	
• Median (range)	23 (12 – 71)	68 (15 – 79)	
After 3rd months			0.03*
• Mean ± SD	27.00 ± 15.05	57.78 ± 18.58	
• Median (range)	24 (12 – 71)	66 (15 – 78)	
After 6th months			0.004*
• Mean ± SD	28.08 ± 15.45	56.78 ± 20.29	
• Median (range)	24 (12 – 71)	64 (9 – 81)	

Quantitative data are presented as mean ± SD and median (range). P-value is significant ≤0.05.
P-value: Comparing both studied groups

At all follow-ups, there were significant differences between the studied groups (p values 0.01, 0.03, and 0.004, respectively).

Discussion

The current study included 52 patients diagnosed with knee osteoarthritis. Both study groups were comparable regarding the baseline data that could confound the study outcomes. Patients who received BoNT-A injection recorded significantly lower WOMAC score for pain compared to patients who received Radio-frequency waves, then both groups recorded comparable WOMAC score for pain at the last assessed time point (after 6th months of treatment)

Each studied group showed a significant reduction in WOMAC score for pain from baseline to after 6th months of treatment (P<0.001, for both groups). While the WOMAC score for stiffness shows contradictory results between both studied groups, as we observed that, despite that, the BoNT-A group recorded a significantly higher WOMAC score for stiffness compared to the Radio-frequency group at baseline, this difference rapidly disappears after one month of treatment, which is confirmed by the absence of difference between both studied groups.

Additionally, after the 3rd and 6th months of treatment, patients who received BoNT-A recorded significantly lower WOMAC scores for stiffness than patients in the Radio-frequency group. Interestingly, we observed that the patients in the BoNT-A group showed a significant reduction, while the patients in the Radio-frequency group showed a significant increase in WOMAC score for stiffness from baseline to after 6th months of treatment (P<0.001, for both).s

The role of BoNT-A in clinical management is now considered as part of an established option for chronic advanced arthritis or osteoarthritis if a patient has been refractory to conservative treatments, failed corticosteroid or hyaluronic acid IA injection, and is unable to undergo joint surgical intervention. As compared with conventional therapy, IA BoNT-A injection has a significant therapeutic effect on pain processing and functional recovery **(9)**.

Chou et al conducted an open-label study and found that the only significant effect was a decrease in the WOMAC pain score in the subgroup with stage III disease (P < 0.001). This subscore was still significantly diminished versus baseline after 5 and 6 months (P < 0.05). The absence of BoNT-A effects in stage IV disease is probably ascribable to advanced cartilage damage, which, in our view, indicates a need for knee replacement surgery **(10)**.

The main limitations of the current study were: 1) relatively small sample size, 2) Short duration of follow-up.

Conclusion:

Based on the current study, we could conclude tha**t** intra-articular Botox was more impactful than radiofrequency ablation of the genicular nerves in the context of pain alleviation and stiffness improvement. Future study with more cases is warranted to draw a firm conclusion.

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