# Ultrasound-guided Genicular Nerve Ablation with Alcohol Solution for Knee Osteoarthritis: A Case Series

John Butarbutar[1], Mirna Phandu[1], Kevin Lee[2], Earlene Tasya[2], Wendell Sebastian Sulaeman[2]

*[1] Department of Orthopedic, Siloam Hospital Lippo Village, Karawaci, Tangerang, Banten, Indonesia*
*[2] Faculty of Medicine, Pelita Harapan University, Karawaci, Tangerang, Banten, Indonesia*

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**Correspondance:**John Butarbutar
**E-mail** : john.butarbutar@lecturer.uph.edu
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**Abstract**

Genicular nerve ablation using radiofrequency (RF) is a common minimally invasive procedure for painful osteoarthritic knees. However, the high cost and unavailability of equipment in many healthcare centers made this inconvenient for some patients. Some case reports tried the cheaper and newer method, using an alcohol solution to ablate the genicular nerves, showing considerable improvement in the patient's pain, functional knee score, and quality of life. We have attempted the ultrasound-guided genicular nerve ablation using alcohol solution in 6 patients with knee osteoarthritis to complement the body of evidence. We found that the genicular nerve ablation using alcohol solution is an excellent method for relieving symptoms of knee osteoarthritis if knee pain is the main symptom.

## Introduction

Genicular nerve ablation is a common non-surgical, minimally invasive choice for painful osteoarthritic knees. The common method is using radiofrequency (RF) to ablate the genicular nerve. However, the high cost and unavailability of equipment in many healthcare centres made this treatment inaccessible for some patients.

Instead of using RF, some case reports tried the cheaper and newer method, using an alcohol solution to ablate the nerves, and surprisingly showed a promising improvement or progresses in patient's pain symptoms, knee functional score, and their quality of life.[1,2] A recent trial also shows the effectiveness of the genicular nerve alcohol ablation. There is a significant improvement in VAS score, NRS score for walking, and WOMAC scores for the 1st and 6th months after the treatment.[3] To complement the body of evidence, we have attempted the ultrasound-guided genicular nerve ablation using alcohol solution in 6 patients with knee osteoarthritis. We found that the genicular nerve ablation using alcohol solution is an outstanding and cheap method for relieving symptoms of knee osteoarthritis if knee pain is the main symptom.

## Case Illustration 1

A 71-year-old female presented with a history of left knee pain 19 years ago. She came to our clinic and complained about her persistent knee pain and stiffness that didn't go away. She rates her pain 5 out of 10 on a numerical rating scale (NRS). She still can walk far and go to the groceries alone while withstanding her pain. She still can do daily activities in the house but with moderate difficulty. She can't fully flex her knee because she says it's really painful. She had a history of multiple sodium hyaluronate injections and physiotherapy sessions, but it

wasn't helpful. Overall, the WOMAC score was 48. The knee x-ray shows that she has advanced knee osteoarthritis. She decided not to have knee replacement surgery because she was so scared that no one will take care of her. 1 week before the nerve ablation procedure, the diagnostic block was done and showed a great response. The NRS score became 5 from 10. The USG-guided superomedial genicular nerve, inferior-medial genicular nerve, and superolateral genicular nerve ablation were performed with 1 mL of 2% lidocaine followed by 1 mL of 96% alcohol at each nerve. She reported the NRS score dropped to 3 out of 10, 24 hours after the procedure. 1 month after the procedure, the patient said that her knee was better than before, but there were still some difficulties in daily activity. The WOMAC score became 35, but the NRS was still 3 out of 10.

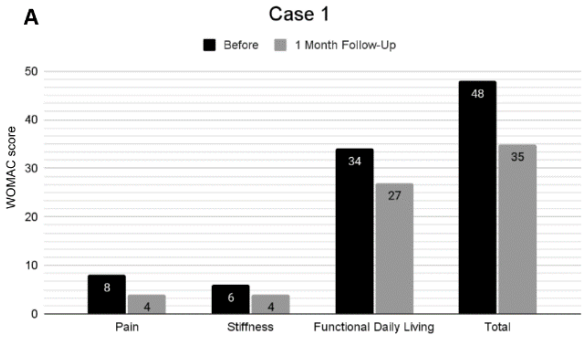


**Figure 1**. Western Ontario and McMaster Universities Arthritis Index (WOMAC) score results from case 1. There was significant improvement of WOMAC score in case 1, 4, and 5 (A, D, E).

## Case Illustration 2

A 60-year-old male presented with a history of left knee clicking and stiffness with moderate pain since 10 years ago. He told that he cannot do full knee flexion because it is painful. He still can walk far about 100 meters without pain. The overall NRS score was 6 out of 10 and the WOMAC score is 38. The knee x-ray showed he had grade IV knee osteoarthritis. He had a history of left knee astroscopic lavage and debridement in 2016 but he feels no improvement. He also had a history of dyslipidaemia and benign prostate hyperplasia, controlled with medicines. 1 week before the genicular ablation, the diagnostic block with lidocaine was done. He said he felt better for about 3 days after the injection, with the NRS score dropping to 4. The same ultrasound-guided genicular nerve ablation procedure was done with 1 mL of 2% lidocaine followed by 1 mL of 96% alcohol at each nerve. After the procedure, he felt better with the NRS score dropping to 3, but he noted that the mechanical symptoms stills annoyed him. 1 month after the procedure, the patient said that overall there is no improvement in his knee symptoms after treatment, with the NRS score still 3 and the WOMAC score became 40. Note that he complained more about his knee mechanical symptoms, rather than his knee pain.

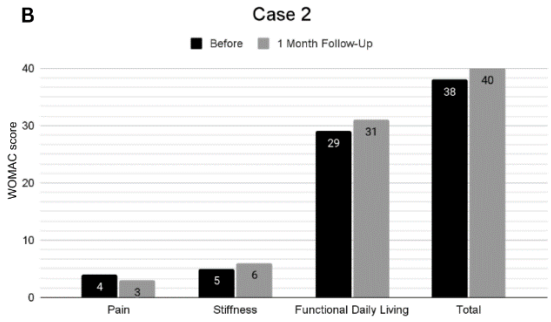


**Figure 2**. Western Ontario and McMaster Universities Arthritis Index (WOMAC) score results from case 2. In cases 2, 3 & 6 (B, C, F), the WOMAC score before and after treatment are relatively the same.

## Case Illustration 3

A 61-year-old female came to the clinic complaining about her left knee stiffness since 2019 that got worse 2 weeks ago. She felt stiffness every day, especially when sitting or resting for too long. She felt better when she moved her legs. She also told that she felt a clicking sensation from her left knee and the clicking got louder when she walks on the uneven surface. The NRS score was 6 out of 10 and the WOMAC score was 51. She went to a physical therapy session once, but she didn't like it because she said that it made her knee

pain. She had a history of uncontrolled primary hypertension. The nerve block was done and she felt better for a while because of her knee pain reduction, but she was still annoyed by her knee mechanical symptoms. The same ultrasound-guided genicular nerve ablation procedure was done with 1 mL of 2% lidocaine followed by 1 mL of 96% alcohol at each nerve. After the procedure the NRS score dropped to 2. 1 month after the procedure, the patient said that her mechanical knee symptoms got worsened. After a more in-depth history taking, the overall NRS score was still 2 but the mechanical symptoms made her uncomfortable. She said that her left knee became really stiff and very difficult to walk now, even on flat surfaces. The clicking sensation also got worse. The WOMAC score became 63.

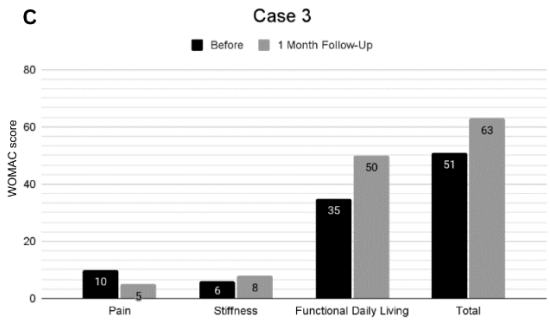


**Figure 3**. Western Ontario and McMaster Universities Arthritis Index (WOMAC) score results from case 3. In cases 2, 3 & 6 (B, C, F), the WOMAC score before and after treatment are relatively the same.

## Case Illustration 4

A 64-year-old male came to the clinic with a chief complaint of pain in his left knee since 2011 which got worse in the past few weeks. The pain in his left knee worsen when she walked for about 20 meters, pain especially when he was having stairs, sitting for a long amount of time, and when he tried to flex her knee fully. She also felt a clicking sensation, especially when getting on vehicles on her left knee with minimal stiffness present. The patient also had a varus deformity present with a history of grade III knee osteoarthritis previously. The NRS score was 5 out of 10 with a WOMAC score of 43. The patient several times were having an intraarticular injection which could last for more than 1 year, but as of now gradually does not last that long. An ultrasound-guided genicular nerve ablation procedure was done with 1 mL of 2% lidocaine followed by 1 mL of 96% alcohol at each nerve. After the procedure was done, the overall NRS score was 0. 1 month after procedure, a detailed history taking was done and He told after the procedure about 80% of the symptoms subsided. The residual symptoms as of now were minimal but increased in certain activities such as getting on vehicles, standing and walking for a long time. The WOMAC score became 35.

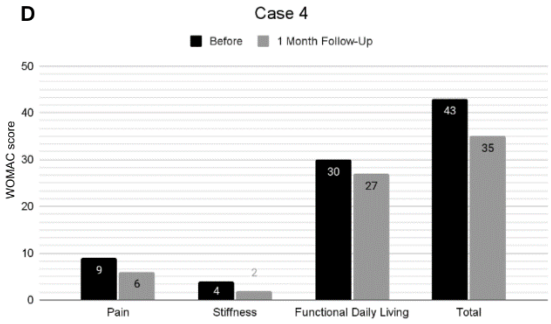


**Figure 4**. Western Ontario and McMaster Universities Arthritis Index (WOMAC) score results from case 4. There was significant improvement of WOMAC score in case 1, 4, and 5 (A, D, E).

## Case Illustration 5

A 79-year-old female came to the clinic with a complaint of pain in her right knee for 9 months. She felt the pain in her right knee accompanied by a clicking sensation. The pain was felt especially when she walked around her house, climbing stairs which also need the assistance of others, and every morning she also felt stiffness. She felt her activity was slightly limited but overall didn't need assistance except for climbing stairs. She had a history of filariasis on her left leg. The NRS score was 6 out of 10 with a WOMAC score of 53. An ultrasound-guided genicular nerve ablation procedure was done with 1 mL of 2% lidocaine followed by

1 mL of 96% alcohol at each nerve. After the procedure was done, the overall NRS score was 4. Following the procedure, she could walk on her own without assistance to the parking lot from the orthopaedic outpatient department. After 1 month, she was able to bend her knee more confidently than before but climbing stairs still has been a challenge for her. The WOMAC score was 35 with an NRS score of 1 out of 10.

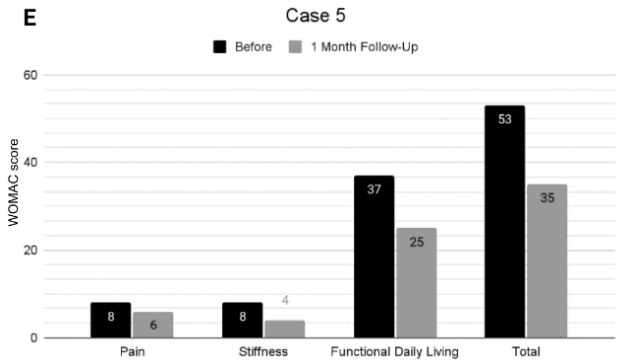


**Figure 5**. Western Ontario and McMaster Universities Arthritis Index (WOMAC) score results from case 5. There was significant improvement of WOMAC score in case 1, 4, and 5 (A, D, E).

## Case Illustration 6

A 65-year-old female came to the clinic with stiffness in her left knee for 1 year. She felt a clicking sound when she moved her knee but otherwise not too disturbing or experiencing any pain. She complained of knee stiffness especially in the morning when she woke up and felt extreme pain. The Pain also comes and goes when getting up from sitting, walking about 100 meters, climbing, or getting downstairs but otherwise did not need any crutches, walker, or assistance. The NRS score was 8 out of 10 with a WOMAC score of 50. An ultrasound-guided genicular nerve ablation procedure was done with 1 mL of 2% lidocaine followed by 1 mL of 96% alcohol. Due to very low pain tolerance, only superomedial genicular nerve (SMGN) and inferior medial genicular nerve (IMGN) were ablated, leaving the inferior lateral genicular nerve (ILGN). After the procedure, the NRS score became 0. After 1 month, the pain decreased. However, the stiffness got worse according to her. The overall WOMAC score was 52 with an NRS score became 4 out of 10.

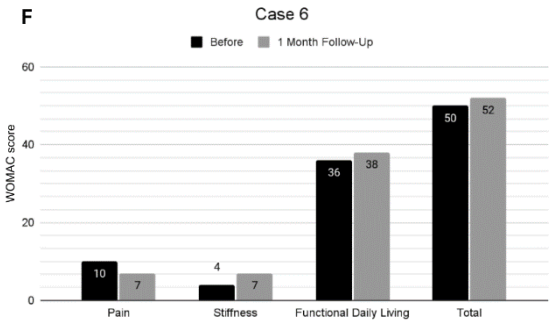


**Figure 6**. Western Ontario and McMaster Universities Arthritis Index (WOMAC) score results from case 6. In cases 2, 3 & 6 (B, C, F), the WOMAC score before and after treatment are relatively the same.

## Discussion

Our case report showed that genicular ablation using alcohol solution may become a viable option for chronic painful knee osteoarthritis. After the procedure, the pain section from the WOMAC score was increased and the NRS was reduced in all patients after a month. RF (radiofrequency) is popularly used for neurolysis procedures and is supported by many studies.[4-7] However, it has its disadvantages due to higher costs. In the current evidence, alcohol neurolysis is a safe, effective, and low-cost procedure with preferably good results. Since alcohol causes iatrogenic neural degeneration, it spares the motoric function of the nerve. Thus, alcohol neurolysis can be reliable as a palliative treatment for chronic painful osteoarthritis without altering the patient's ambulatory.

To our knowledge, the alcohol neurolysis to the genicular nerve procedure was first introduced in a case report by Dass et al.[1] Our case report has a similar procedure, using about 50% alcohol concentration to avoid permanent neurolysis of the genicular nerve.[9]

However, we didn't use contrast dye in the mixture and fluoroscopy machine. Since fluoroscopy increases the accuracy of the injection site, unnecessary damage to another soft tissue/structure can be avoided. However, in our preference, using ultrasonography alone is still reliable enough as a guidance tool and also has lower radiation exposure. Following Dass et al., the study done by Ahmed et al. tried to ablate the middle genicular nerve (MGN), recurrent peroneal nerve (RPN), and inferior lateral genicular nerve (ILGN) and showed good results in 1-month and 6 months follow-ups.[2] Future studies were needed to look at the long-term effect of alcohol neurolysis on the genicular nerve for longer than 6 months. A recent trial by Elashmawy et al. also looks at the efficacy of alcohol neurolysis, compared to nerve block alone. All 23 patients treated with alcohol neurolysis maintained the VAS score, NRS, and WOMAC score after 6 months.[3] Ahmed et al. and Elashmawy et al. used alcohol and an anaesthetic solution, instead of injecting the anaesthetic and alcohol separately.

Besides the advantages, alcohol neurolysis is an excruciating procedure in most of our patients. In our experience, it will be more pleasant for the patient if we inject the alcohol really slowly to the genicular nerve. The procedure also most likely doesn't work out for the patient if they are more concerned with the mechanical symptoms of the knee rather than the knee pain.

We use the WOMAC (Western Ontario and McMaster Universities Arthritis Index) to assess patient feedback and treatment satisfaction. WOMAC was first developed in 1982 and widely used to evaluate knee or hip osteoarthritis patients. All of the cases had improved pain scores. Some of the patients who satisfied with the procedure were also improved their quality of life/physical function and stiffness score. However, in case 2, 3, and 6; the patients mostly complained about the mechanical symptoms of the knee, e.g. clicking and catching sensation.

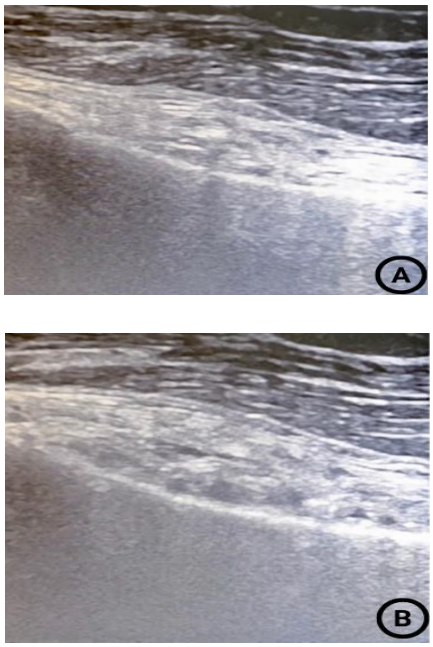


**Figure 7**. Inferior medial genicular nerve (IMGN) before ablation using alcohol solution (A). IMGN after ablation using alcohol solution (B).

## Conclusion

In conclusion, alcohol may become a great tool as a neurolysis agent besides radiofrequency (RF). However, future high-quality randomized controlled trials were needed to confirm the efficacy of alcohol neurolysis compared to RF.

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**John Butarbutar, MD**