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The use of cold dialysis solution in reducing fatigue in an end-stage renal disease patient

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ABSTRACT A clinical decision report using:

Sajadi M, Gholami Z, Hekmatpour D, Soltani P, Haghverdi F. Cold dialysis solution for hemodialysis patients with fatigue - a cross-over study. *Iranian Journal of Kidney Diseases.* 2016;10(5):319-24.

for a patient with sickle cell disease.

Keywords: *cold dialysis, ESRD, fatigue*

Clinical-Social Context

Zachary Gilbert [pseudonym] is a 27 year old man with a history of end-stage renal disease secondary to hemoglobin SS and multiple admissions for sickle cell pain crises. Mr. Gilbert had pain in his lower back, elbow, and knee for 5 days, which prompted him to come to the emergency room. He typically controls his pain at home with oxycodone 30 mg TID and Tylenol, but this pain has been persistently 6 out of 10 with no relief. He receives dialysis Monday-Wednesday-Friday due to his end-stage renal disease. His last dialysis session was two days prior to his arrival to the ED. Mr. Gilbert also regularly follows up at a hematology clinic to manage his sickle cell disease, and he has access to regular medical care. At home, Mr. Gilbert lives with his mother and two siblings in stable housing and a safe neighborhood with adequate transportation. Mr. Gilbert received his associates degree and has stable employment.

During his admission on the medicine floor, his pain continued to be inadequately controlled (6 to 7 out of 10) despite being given a patient-controlled analgesia pump. Concurrently, Mr. Gilbert denied receiving dialysis because he did not want to deal with the symptoms of hemodialysis while also going through this pain crises. The medicine and nephrology teams allowed him to delay dialysis for the first couple of days, but his potassium began to be elevated following 2 days of dialysis refusal.

On Day 5 of admission, his potassium reached 6.6 mmol/L, and the teams decided Mr. Gilbert could no longer wait without intervention. However, Mr. Gilbert continued to refuse. At this moment, he was at 7 days without dialysis (two days while out of the hospital; five days while in the hospital). He continued to state the reason for denial was he did not want to have to deal with the symptoms of dialysis at the current moment. He said that dialysis made him feel extremely fatigued, and he felt that no one in the room could understand what he has to go through every week of his life. He was also adamant in refusing calcium gluconate and insulin-glucose treatment because he did not want any more medications in his body. The care teams were in contact with the patient's mother who

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expressed deep concern for her son skipping dialysis and urged us to convince Mr. Gilbert to receive treatment. At this point, the medicine team alongside support from nephrology, hematology, and the critical care team needed to balance the patient's wishes with concerns for cardiac arrhythmias secondary to hyperkalemia.

Clinical Question

Is there a non-pharmaceutical intervention available to reduce fatigue during hemodialysis in end-stage renal disease patients?

Research Article

Sajadi M, Gholami Z, Hekmatpour D, Soltani P, Haghverdi F. Cold dialysis solution for hemodialysis patients with fatigue - a cross-over study. *Iranian Journal of Kidney Diseases.* 2016;10(5):319-24. [1]

Description of Related Literature

On PubMed, the initial search criteria used filters for only clinical trials and randomized controlled trials while searching "(fatigue) AND (dialysis)". The search returned 119 results. 95 results did not mention treatment options for fatigue during hemodialysis so these were excluded (many were just ESRD in general and not specific to hemodialysis). Three results included pharmaceutical approaches to treating fatigue, so these were excluded because the patient did not want to consume any more medications. Five search results involved exercise or nutritional routines that required weeks of the regimen to provide results; Mr. Gilbert was looking for an intervention that he could use that day to improve his fatigue. Two trials involved acupuncture needles, and needles were one of the main interventions the patient was trying to avoid. Of the fourteen trials remaining, ten of them were either preliminary trials or studied effects beyond fatigue such as pain, depression, and anxiety. We just wanted to focus on fatigue.

The Ahmady et al. trial looks at the effects of aromatherapy using oil, which was proven to reduce fatigue.[2] The Cecen et al. trial looks at massages and the effects on fatigue, which also proved to be beneficial.[3] However, the Varaei et al. proved that massage with aromatherapy was better than just aromatherapy.[4] While these trials showed promising results for improving patients fatigue during dialysis, the papers were not used for logistical concerns. Our patient was looking for an immediate solution to his fatigue during dialysis. These other therapies would involve utilizing more staff and resources to effectively deliver the proper care. Given that the hospitals are already short staffed with nurses and technicians, we did not see these as viable options for treatment in this case.

At the end of this literature review, a 2016 study in the Iranian Journal of Kidney Diseases presented a study on cold dialysis solution that may have strong implications in the future for treating fatigue in dialysis patients.[1] The double-blinded cross-over study recruited 46 participants and randomly assigned participants into two groups. Participants needed to be at least 18 years of age, have been receiving dialysis for at least 6 months, and attended 3 sessions per week. Each group either received a week (3 sessions) of 37C or 35.5C dialysis solution. After the week, the groups switched, and the participants received the other dialysis solution. Participants rated their fatigue each week using the Piper Fatigue Scale. The lower temperature led to a 31.3% reduction in fatigue. Given the results of this randomized controlled trial, cold dialysis solution for preventing fatigue during dialysis has Grade B level of evidence.[5]

Critical Appraisal

The study done by Sajadi et al. involved 46 patients and selected patients based on inclusion criteria mentioned above. According to SORT criteria, the study is level 2 for the level of evidence.[5] Furthermore, patients needed to have experienced fatigue at some point during their dialysis sessions. Patients also could not be dependent on narcotics or have chronic anemia. Once 46 participants (originally meant to be 42) were enrolled, a double-blind crossover study was performed. Patients were assigned to one group and received 3 sessions of either 37C or 35.5C dialysis over a span of one week. After one week, participants were then put into the other group. This allowed participants to be compared to themselves and eliminate biases within participants' answer choices.

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To evaluate the effectiveness of cold-dialysis on fatigue, the Piper Fatigue Scale questionnaire was used to determine the level of fatigue of participants. This questionnaire involved numerical ratings with zero meaning no fatigue, 1 to 3 representing weak fatigue, 3 to 6 as average fatigue, and 7 to 10 as severe fatigue. Because the Piper Fatigue Scale involves numbers for assessing fatigue, this was an important factor to allow for unbiased assessment of fatigue. The Piper Fatigue Scale was developed in 1990 and has been used since to quantify fatigue. Many studies have been done to show its reliability across different cultures.[6-8] In our patient's case, he would be able to use this scale during his regular dialysis sessions, and when he received cold dialysis solution, the scale could be used again to see if there was an improvement in his fatigue.

A potential factor that could inhibit the double-blind aspect of the study is the fact that some participants received cold dialysis first, which is a different dialysis than what they are used to, so participants may have been aware of what solution they were receiving if they were able to tell the difference between the two solutions. This very well could have biased their answer choices in the Piper Fatigue Scale.

Another component limiting the applicability of the study results is the causes of end-stage renal disease. The average age of the participants was 58.46 +/- 13.46 years. The most common cause of end-stage renal disease in the participants was diabetes mellitus, but this only accounted for 47.8% of the participants. The other causes included hypertension, polycystic kidney disease, glomerulonephritis, and others. Because different pathological processes were involved in the participants, this may limit the applicability of the trial.

Analysis of the data was done using the Statistical Package of the Social Sciences while using t tests with a p value less than 0.05. The results found that fatigue could be reduced by 31.3% and cold dialysis could be an effective method for reducing severe fatigue in end-stage renal disease patients.

Clinical Application

A limiting restraint of this study when applying to our patient was the average age of participants and reasons for end-stage renal disease. The average age of participants was 58.46 +/- 13.46 years, which makes Mr. Gilbert 31 years younger than the mean age of this clinical trial. Also given that Mr. Gilbert's cause of end-stage renal disease was glomerulonephritis secondary to sickle cell disease and that most of the patients in the trial had diabetes mellitus, it makes it hard to say that these results can be definitively applied to our patient.

Furthermore, dependence on narcotics was an exclusion criterion for this trial. However, the reason for this exclusion was the researchers wanted to ensure the participants had an appropriate level of alertness to answer the questions. Our patient's narcotic use was necessary for his pain control. We felt that the narcotics did not hinder his alertness, so he would be able to notice a difference in fatigue levels if the treatment worked for him.

Nevertheless, the results of the Sajadi et al. trial could have had beneficial effects on our patient. Mr. Gilbert's potassium was reaching critical levels, and the reason he gave for skipping dialysis was that he did not want to experience the fatigue that typically occurs with dialysis. Cold dialysis could have been an effective treatment option for him, and we could have explained to him and his mother that this new process could reduce the negative effects that he associates with dialysis without having to poke him with new IV ports or add new drugs to his regimen, which he was adamantly against. For someone that has regular access to healthcare and regularly attends dialysis, cold dialysis could be a potentially helpful method for him going forward. Currently, the patient's hospital does not offer cold dialysis solution nor do any dialysis centers in the area, but with further research, cold dialysis may become an option in the future.

New Knowledge Related to Clinical Decision Science

One factor that may be in question is the external validity of this trial. While cold-dialysis worked for participants in this trial, it is unknown if cold dialysis would be effective in a patient with sickle cell disease. There is insufficient data available to confidently say that this method would work for Mr. Gilbert. However, it is certainly an area of medicine that is worth exploring and could be very beneficial for patients. "Being heard" and "Taken seriously" are important aspects of care for patients with vaso-occlusive crises and

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ESKD. The social interaction of listening and trying to understand the patient's experience builds trust in the relationship, which might lead to additional information from the patient, eventually leading to a consensus clinical decision.[9]

Conflict Of Interest Statement

The author declares no conflicts of interest.

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