# DIABETIC PATIENTS RECEIVING PERITONEAL DIALYSIS EXPERIENCE REDUCED SYMPTOMS OF GASTROPARESIS WHEN INSULIN IS ADDED TO THE DIALYSATE

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Diabetes is a systemic disorder that is occurring in epidemic proportions. Inadequate glycemic control can result in end-organ damage such as gastroparesis, retinopathy, nephropathy, and peripheral neuropathy. Patients with diabetic gastroparesis typically experience symptoms such as early satiety, nausea, or vomiting. If they have renal failure and select peritoneal dialysis as the method of renal replacement therapy (RRT), symptoms of gastroparesis can be exacerbated. Due to acute hyperglycemia if dextrose is present in the dialysis fluid, or if pressure of the dialysate is instilled in the peritoneal cavity, the result can be worsening of gastrointestinal (GI) symptoms, decreased quality of life, and increased frequency of admission to a hospital. Data from the medical literature reveals no large-scale, randomized, double-blinded, controlled clinical trials addressing the addition of insulin to peritoneal dialysis (PD) fluid and its effect on outcomes such as quality of life, decreased GI symptoms, or decrease in hospital admissions. We hypothesized that addition of Lispro insulin to PD fluid containing dextrose would result in improved glycemic control, decreased need for admission to a hospital for working symptoms of gastroparesis, and improved quality of life in individuals who have diabetes and require PD as RRT.

In order to assess the effectiveness (reduce the symptoms of nausea and vomiting) of intraperitoneal insulin (IP) administration in patients receiving peritoneal dialysis, we developed an audit tool. The results of the patients receiving IP insulin in comparison to those receiving PD without insulin are pending. Patients in the sample size come from the private practice of a nephrologist and an endocrinologist.

## INTRODUCTION

Major fluctuations in blood glucose can be prevented in patients receiving intraperitoneal insulin during peritoneal dialysis (PD).[1] Hyperglycemia (high blood glucose) is caused by not enough insulin in the body.[2] Insulin administration can decrease glucose. Comorbidities such as retinopathy, nephropathy, gastroparesis, and neuropathy can be complications resulting from diabetes. Hyperglycemia is a major contributing factor in causing nephropathy by damaging the kidney's filtration system.[3] Over a prolonged period of time, many essential elements, such as protein, are lost, and the kidneys eventually fail. Diabetes can also damage the vagus nerve, which controls the movement of food through the digestive tract[3]; therefore, many patients with diabetes not only have nephropathy but gastroparesis, which can be manifested by episodes of nausea and vomiting. Up to 75% of patients with diabetes suffer from gastroparesis.[4]

Humalog (insulin lispro, rDNA origin) is a common insulin used to treat diabetes.[5] Some studies have confirmed that insulin administration can decrease adverse symptoms of gastroparesis. Little research has been published focusing on insulin administration in peritoneal dialysis (PD) fluid in an attempt to improve glycemic control and decrease symptoms of gastroparesis. The most important benefit of intraperitoneal (IP) insulin administration with PD is improvement in the patient's quality of life and reduced length of stay in a hospital. In order to test the efficiency of insulin administration in PD fluid, a data collection tool was formulated to analyze the effectives of IP insulin administration.

## METHODS

Patients receiving PD from a nephrologist were recruited into this study. All patients in the study group received IP insulin, and had symptoms of gastroparesis, allowing data to be focused on IP insulin effectiveness on gastroparesis symptoms. Patient medical charts were reviewed without violating confidentiality regulations. A data collection tool specifying patient's symptoms before and after IP insulin administration in the dialysate was developed and utilized in the research.

All patients (9) in the study were from one clinic. The data sheet specified the following: patient identification; major comorbidities; glucose lab-level pre-PD; diabetic type; nausea pre-PD; vomiting pre-PD; insulin given/type; post-nausea with insulin; post-vomiting with insulin; admittance into hospital. Specific data collected from the data sheet was transported to a bar graph for visual analysis.

## RESULTS

Figure 1 provides details on rates of nausea and vomiting before and after IP insulin in PD fluid. For this group, the average glucose level of the patients was 182 (data not shown). Only 3 out of 9 patients experienced nausea and/or vomiting and 100% of patients denied nausea and/or vomiting after IP insulin with PD fluid.

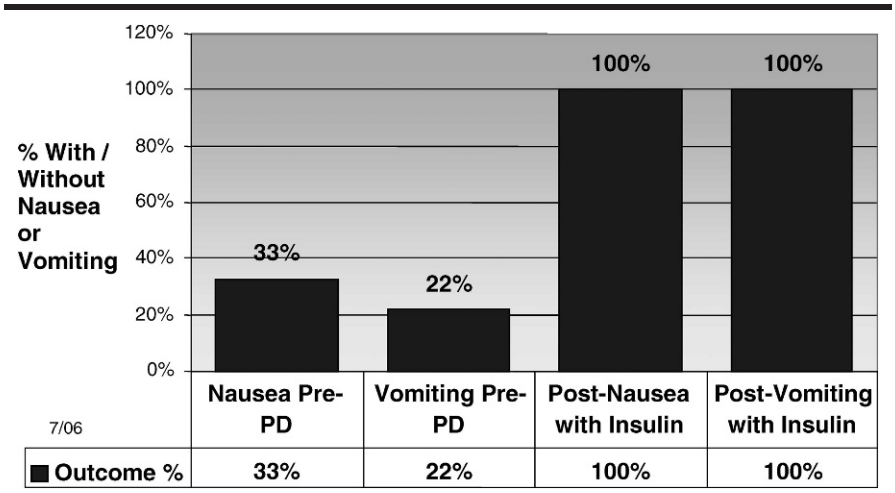


**Fig 1. Intraperitoneal insulin administration in PD fluid and effect on nausea/vomiting in diabetic patients**

Only 1 of the 9 patients was admitted to the hospital.

All patients in the sample size received RRT; 6 of the 9 patients experienced end-stage renal failure, two experienced chronic renal failure, and one had acute renal failure. Of the 3 patients experiencing nausea and/or vomiting, none experienced these symptoms post IP insulin with PD; however, the small sample size fails to provide much statistical significance. Larger trials will be needed to confirm efficiency of IP insulin administration in individuals with diabetes who chose PD as the method of RRT and experience gastroparesis.

## DISCUSSION

The results of our data did not clearly confirm our hypothesis. Hypothetically, IP insulin administration in PD fluid should improve glycemic control. PD, a method for removing waste such as urea, potassium, and excess fluid, (ie, renal failure), is a form of renal dialysis, and is a form of renal replacement therapy. The patients who participated in this research experienced RRT from renal disease or renal failure and elected to receive PD.

Limitations in this research resulted in a less-than-desirable outcome. Only 9 patients participated in the study; they were all from one clinic, which limited the opportunity for variability. A control group could not be extracted due to available resources. The original format of the data tool had to be revised due to inaccessible patient information. Available patient files did not record pre-PD symptoms, or a control group of patients who did not have IP insulin in their PD. HIPAA regulations and confidentiality standards of the office prevented communication with patients.

## REFERENCES

1. Quellhorst E. Insulin therapy during peritoneal dialysis: pros and cons of various forms of administration. *J Am Soc Nephrol*. 2002;13: s92–s96.
2. American Diabetes Association. *Hyperglycemia*. Available at: http://www.diabetes.org/youthzone/hyperglycemia.jsp. Last accessed: August 7, 2006.
3. NIDDK/NIH. *Gastroparesis and Diabetes*. Washington, DC: National Digestive Diseases Information Clearing House. 2003. Available at: http://digestive.niddk.nih.gov/ddiseases/pubs/gastroparesis/index.htm. Last accessed: August 7, 2006.
4. Perez MG, Husserl F, Ross J. Intraperitoneal metoclopramide causing a movement disorder. *Oxford Journals*. 2002;17:945, Available at http://ndt.oxfordjournals.org/cgi/content/full/17/5/945. Last accessed: August 3, 2006.
5. Insulin Lispro (Human Analog). *RXList* 2004;PXList, Inc.. Available at http://www.rxlist.com/cgi/generic/insulinlispro.htm. Last accessed July 31, 2006.