

# Volume Control by Using the Body Composition Monitor in a Puerperal Patient on Hemodialysis

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Accurate measurement of the volume status in hemodialysis patients is important as it can affect mortality. However, no studies have been conducted regarding volume management in cases where a sudden change of body fluid occurs, such as during puerperium in hemodialysis patients. This report presents a case in which the patient was monitored for her body composition and her volume status was controlled using a body composition monitor (BCM) during the puerperal period. This case suggests that using a BCM for volume management may help maintain hemodynamic stability in patients with a rapidly changing volume status for a short term period, such as during puerperium.

**Key Words:** body composition; hemodialysis; postpartum period; volume control

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## Introduction

Fluid overload in hemodialysis patients is associated with poor survival and increased cardiovascular mortality<sup>1, 2</sup>; therefore, accurate evaluation of the volume status is important. Conventional evaluation of the dry weight, such as according to patients' symptoms and physical

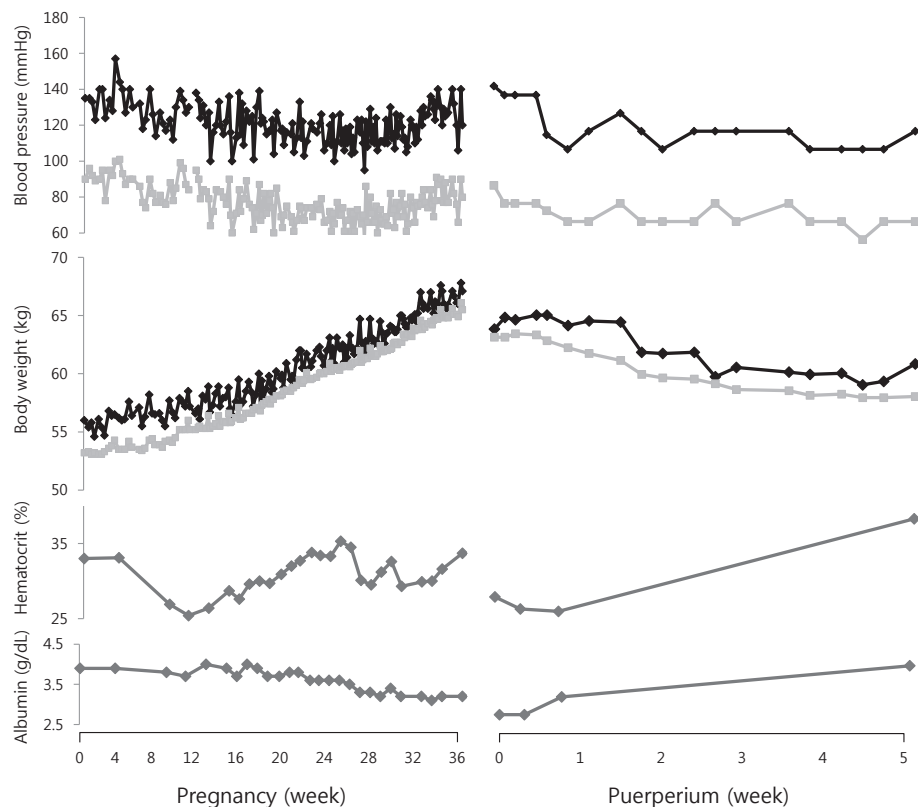
examination, is neither accurate nor reliable<sup>3</sup>. Recently, new devices including a body composition monitor, can provide a rapid, accurate estimation of the volume status<sup>4</sup>. Several recent studies have been conducted for volume management of hemodialysis patients based on using a body composition monitor (BCM, Fresenius Medical Care, Germany)<sup>5, 6</sup>. However, no studies have been conducted on

hemodialysis patients, who show rapid body weight change during the puerperal period. This study examined whether or not a BCM can be used for the volume management of a puerperal patient on hemodialysis and whether this type of management can affect the hemodynamic stability.

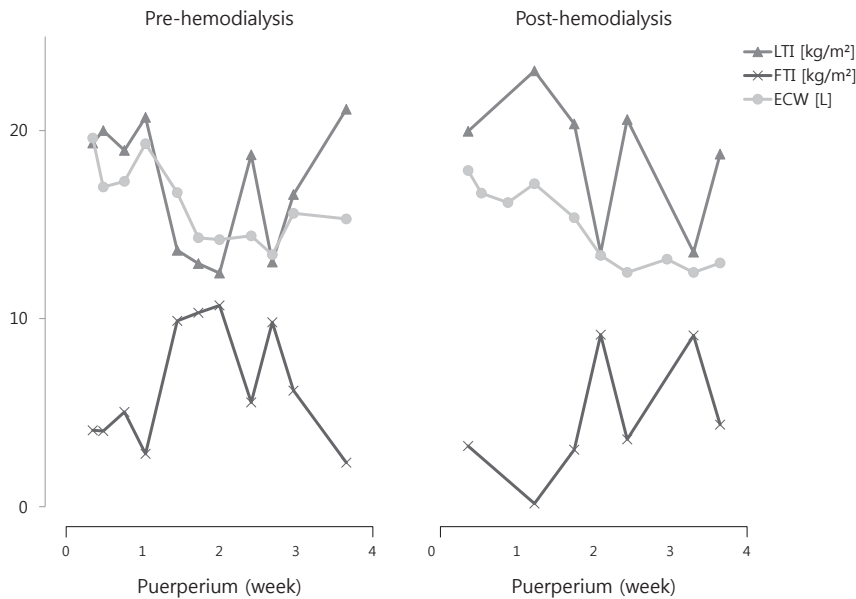
### Case report

A 37-year-old female patient started hemodialysis 17 years previously and the cause of her end stage renal disease was chronic glomerulonephritis. She had a history of 2 miscarriages and she had no residual renal function. During pregnancy, the dialysis dosage was gradually increased, and the frequency of hemodialysis therapy was increased to 5–6 sessions/week from the second trimester to delivery. Her dry weight had gradually increased from

53.2 kg to 62.3 kg (Fig. 1). She underwent Cesarean section for an intrauterine pregnancy at 37 weeks. Two days after delivery, a BCM was used before and after each hemodialysis session. When overhydration was measured using the BCM, the dry weight was calculated as follows: dry weight = (body weight at prehemodialysis) – (the amount of over-hydration). Posthemodialysis weight reduction was performed in steps within 0.5–1 kg/week. During the puerperium, her dry weight was adjusted from 62.3 kg to 57.1 kg (Fig. 1). On the examination with the BCM, the extracellular water was decreased, and fat mass fluctuated, but the fat mass tended to be increased during the postpartum period (Fig. 2). Throughout the monitoring period, she had only 1 hypotensive episode; otherwise, she had stable blood pressure and no complaints of hypotensive symptoms, including nausea, muscle cramping, dizziness



**Fig. 1.** Blood Pressure, Body Weight and Laboratory Changes in a 37-year-old Female Patient during Pregnancy and the Puerperal Period. Systolic blood pressure (black line) and diastolic blood pressure (gray line) at pre-hemodialysis remain stable. Body weight at pre-hemodialysis (black line) and body weight at post-hemodialysis (gray line) are gradually increased during pregnancy, and are adjusted during the puerperal period.



**Fig. 2.** Change in Body Composition at Pre-Hemodialysis and Post-Hemodialysis. The extracellular water and intracellular water were decreased, and fat mass fluctuated, but the fat mass tended to be increased during the postpartum period. LTI, lean tissue index; FTI, fat tissue index; ECW, extracellular water.

and headache.

## Discussion

Clinical assessment of the body fluid status after delivery is difficult since the body fluids change rapidly, particularly in hemodialysis patients. This is the first report to measure the objective dry weight of a puerperal patient on hemodialysis using a BCM. This case showed that the BCM may be an accurate and practical way to estimate the target weight, to control a patient's dry weight and to maintain hemodynamic stability during the puerperal period.

In general, the body weight of a pregnant woman shows a gradual increase during pregnancy. Body fat can be stored from 2 to 10 kg due to hormonal mechanisms and the body water increase by 6.5 to 8.5 L by the end of gestation<sup>7</sup>. This patient also gained 9.1 kg of body weight at the end of pregnancy. In the postpartum period, the extra blood and fluids are gradually reabsorbed or excreted via well functioning kidneys. Volume regulation in hemodialysis patients is totally different from that in patients with normal renal function since excess volume should be reduced by

ultrafiltration during hemodialysis. However, there is no available guideline for the volume management of puerperal patients on hemodialysis. In this case, we could estimate the proper dry weight using the BCM and control the fluid overload, and the patients' body weight could reach the dry weight with the patient in a hemodynamic stable condition.

In healthy pregnant women, the maternal blood volume progressively increases. During gestation, the plasma volume increases more than the red blood cell mass; therefore, maternal hematocrit drops and the serum albumin levels progressively fall as a result of hemodilution<sup>8</sup>. In this case, the serum albumin level progressively decreased during gestation, whereas the hematocrit increased after the second trimester. It is possible that the patient's hematocrit was regulated by the administration of erythropoietin stimulating agents and iron.

Cho et al. assessed healthy women's changes in body composition during puerperium using bioelectrical impedance analysis<sup>9</sup>. Extracellular water, intracellular water and the fat-free mass are decreased in puerperium, while the fat mass is increased. In this case, the water and the fat components were similarly changed during

postpartum. Since the main component of the reduction in puerperal body weight is the water content, the assessment of the fluid status in dialysis patients may be noteworthy.

Several studies on the body composition in healthy pregnant women have shown that there is an association between the magnitude of fat or the total body water retention and maternal/fetal morbidity<sup>10, 11)</sup>. However, there has been no study conducted on pregnant women on hemodialysis. During pregnancy, unfortunately, we could not measure the volume status using the BCM in this patient since she refused BCM measurement.

This case is the first report of a puerperal patient on hemodialysis, who was treated on the basis of BCM guidance. BCM guidance may lead to hemodynamic stability in patients who change their volume status during a short period of time. In addition, this data might also provide the baseline data on changes of the body composition in puerperal patients.

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