

Case Report

Transitioning a Patient with Heart Failure and Reduced Cardiac Function from Continuous Dobutamine Infusion to Home Care: A Case Report

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Abstract

The number of patients with heart failure (HF) in Japan is increasing and is projected to exceed 1.3 million by 2030. Patients with advanced heart failure may require continuous dobutamine (DOB) administration for hemodynamic support, and transitioning to home care is complicated by the complexity of drug management and safety concerns. In this case, an 80-year-old man with end-stage heart failure was transitioned to home care while continuing continuous DOB therapy using a portable infusion pump (CADD-Legacy). Despite attempts to reduce the DOB dose, delirium and hemodynamic instability became prominent, necessitating continued administration. To enable home care, a multidisciplinary team—including physicians, nurses, pharmacists, clinical engineers, medical social workers, and visiting nurses—collaborated to develop a protocol for home transition. Pharmacists were responsible for selecting appropriate infusion pumps, assessing drug compatibility, and standardizing preparation methods to ensure safe home administration. After an overnight stay outside the facility and a trial of the infusion pump during hospitalization, the suitability of the administration method was confirmed, and the patient was transferred to home care. This case demonstrates the role of pharmacists in home DOB therapy and highlights the importance of assessing drug compatibility, standardizing infusion administration, and ensuring safety and continuity of care. In view of the future expansion of HF home care, the establishment of standardized protocols and active pharmacist involvement are essential.

Key words: dobutamine, home care, portable infusion pump, multidisciplinary collaboration, heart failure

Introduction

In Japan, the incidence of heart failure is increasing due to an aging population and a rise in lifestyle-related diseases. Projections indicate that the number of new cases will increase by 10,000 per year and exceed 1.3 million by 2030¹⁾. This trend is expected to worsen, especially after 2025, raising concerns about a surge in heart failure cases. Heart failure is primarily caused by impaired cardiac pumping due to structural or functional abnormalities, with symptoms including dyspnea, fatigue, edema, and reduced exercise tolerance²⁾. Dobutamine (DOB) is a synthetic catecholamine that enhances myocardial contractility via β 1-adrenergic receptors. It is primarily used to treat acute circulatory failure during exacerbations of chronic heart failure. Although

DOB improves heart failure symptoms, it requires careful, stepwise dose reduction, as symptoms often recur during tapering. In patients with severely reduced cardiac function, DOB withdrawal can be challenging, complicating the transition to home care. Recently, the usefulness of continuous DOB administration at home for patients with end-stage heart failure has been reported³⁾. The importance of pharmacists' involvement in heart failure home care has also been highlighted⁴⁾, and there is a report of a patient successfully transitioned to home care with continuous DOB therapy⁵⁾. However, there are no detailed reports on the specific methods and considerations for transitioning heart failure patients with severely impaired cardiac function to home care while maintaining continuous DOB administration. In this report, we present the case of a patient

with heart failure and severely impaired cardiac function who was successfully transitioned to home care with continuous DOB administration using a portable intravenous infusion pump.

Case

[Patient]: 80-year-old male patient, height 172 cm, weight 42 kg

[Comorbidities]: Ramsay Hunt syndrome, hypertension, gastroduodenal ulcer, herpes zoster, dyslipidemia, diabetes, autonomic neuropathy, cholangitis, and cholelithiasis

[Oral medications]:

Risperidone oral solution (1 mg/mL, 0.5 mL): 2 packets after dinner

Aspirin (1,000 mg/g): 0.1 g after breakfast

Prasugrel hydrochloride (3.75 mg): 1 tablet after breakfast

Vonoprazan fumarate (10 mg): 1 tablet after breakfast

Lactomin (*Lactobacillus* preparation) powder N: 3 g after each meal

Potassium chloride (K: 13.4 mEq/g): 4 g after each meal

Mosapride citrate (5 mg): 2 tablets after breakfast and dinner

Domperidone (10 mg): 3 tablets after each meal

Magnesium oxide (330 mg): 3 tablets after each meal

Daikenchuto extract: 7.5 g after each meal

Trazodone hydrochloride (25 mg): 1 tablet before bedtime

Insulin: Long-acting, 4 units plus sliding scale coverage

[Injectable medications]:

Dobutamine injection 150 mg/50 mL: 1 syringe

5% glucose solution: 250 mL

Furosemide injection (20 mg/2 mL): 1 ampule

[History of side effects]: Skin symptoms due to contrast media

[Activity of daily living]: care level 4 (*Youkaigo 4*)

[Cognitive function]: intact

[Dysphagia]: Yes

[Presence of a caregiver]: Yes

[Medication management]: Self-management

[Medication adherence]: No problem

[History of present illness]:

The patient was admitted for extensive anterior wall septal myocardial infarction (the date of admission is defined as day 0) and underwent percutaneous coronary intervention (PCI). After PCI, the patient was admitted to the intensive care unit for management of

cardiogenic shock. On day 38, the patient was transferred to the general hospital. On day 55, DOB was tapered with the aim of discontinuation, while Pimobendan was administered. However, when the DOB dose was reduced to 0.5 mL/h, the patient developed significant symptoms of restlessness, including unstable speech and behavior. As a result, the DOB dose was increased again to 1.0 mL/h, and Pimobendan was discontinued. Subsequently, the patient requested home care, and we intervened as a multidisciplinary team.

Clinical Course

From the 80th day onward, the patient frequently expressed a desire for home care. A conference was held in the ward, and with the consensus of the patient, the patient's family, and the medical staff, a decision was made to pursue home care. While continuing DOB administration using a syringe pump, an overnight stay trial was conducted to maintain the patient's motivation for treatment (from day 119 to day 120). The trial was completed without complications.

This was followed by a multidisciplinary conference involving physicians, nurses, pharmacists, clinical engineers, medical social workers (MSWs), and visiting nurses. Pharmacists involved in home care did not participate. The attending physician explained that DOB is indicated for low cardiac output following myocardial infarction and that, although oral DOB is typically considered, the current circumstances made such a switch difficult. The physician also noted that appropriate management of comorbidities was necessary. The nurse reported no issues with nursing care, gastrostomy infusions, or the caregiver's infusion technique. A clinical engineer explained the error-management procedures of a patient-controlled analgesia (PCA) pump. Home care nurses raised concerns regarding route blockage and the timing of PCA cassette replacement. It was agreed that the home care nurse, rather than the patient or caregiver, would be responsible for cassette changes. MSWs coordinated the joint conferences and acted as liaisons between the hospital team and home healthcare providers.

Although the patient qualified for nursing care level 4, it was determined that this would not be a limiting factor in the feasibility of home-based continuous DOB administration, as the visiting nurse would manage the portable infusion pump and cassette replacement—core aspects of DOB delivery.

The pharmacist shared findings from previous studies^{4,5)} on continuous DOB administration using a PCA pump, and provided information on compounding changes and stability. Additionally, suggestions were made regarding the selection of portable infusion pumps, management of compounding changes, and preparation and administration plans for appropriate drug administration in the home environment. For a portable high-precision infusion pump, we proposed the introduction of CADD-Legacy (Smith Medical, Inc.) to enable stable administration while maintaining patient activity. Regarding the management of formulation changes, since DOB may affect chemical stability when administered via the same route as furosemide, we recommended that if furosemide is to be used in combination with DOB, it should be administered via a different route, utilizing a double-lumen peripheral indwelling central venous catheter (PICC) or a similar device. For the preparation and management plan, pharmacists also shared the frequency of the PCA cassette replacement and storage. Although the patient had a wide range of comorbidities and was in a state of polypharmacy, the highest priority in this intervention was the safe home transfer of continuous DOB administration for severe heart failure, which is directly related to life support. Therefore, a comprehensive review and consolidation of existing medications was not the primary focus during this acute-to-home transition phase, but instead focused on establishing a plan for administering DOB.

The direction of the continuous administration of DOB at home using CADD-Legacy was shared again at the joint conference. In addition, approval was obtained from the hospital ethics committee to implement the continuous administration of DOB after the joint conference.

On the 161st day, continuous DOB administration using CADD-Legacy was planned on a trial basis to evaluate its feasibility in the home care setting. The test period was set for five days to observe the condition of the cassettes, including after cassettes replacement. DOB and saline were aseptically mixed with 84 and 168 mL of DOB and saline, respectively, using a cassette (250 mL) for CADD-Legacy. The dosing rate was set at 3 mL/h, considering the frequency of exchange and other factors. During the trial, the CADD-Legacy cassette was replaced once, and the occlusion alarm did not sound during cassette replacement. Since there

were no significant changes in systolic or diastolic blood pressure, body weight, or brain natriuretic peptide (BNP) levels, it was feasible to administer DOB in CADD-Legacy at home. After the trial, the patient was switched back to a syringe pump to continue continuous DOB administration, and CADD-Legacy was used to identify issues in DOB administration. In addition, a 4-day overnight stay study was conducted using this dosing regimen (from day 169 to day 172). No problems occurred during the overnight stay. There were no significant changes in systolic or diastolic blood pressure, weight, or BNP level after the patient returned home (Fig. 1). The patient was discharged home on the 199th day.

During the initial visit on the 5th day after discharge, the patient's progress was confirmed by the attending physician. However, on the 21st day after discharge, the patient developed vomiting, and on the 22nd day, presented with SpO₂ of 94%, body temperature of 37.5 °C, and lower extremity edema, resulting in emergency admission for the treatment of aspiration pneumonia.

Discussion

In this case, a multidisciplinary team including a pharmacist worked together to successfully transition a patient with low cardiac output and heart failure who had difficulty weaning from DOB to home care. This case is a valuable report for the implementation of DOB administration at home, which is expected to increase in the future owing to the new fee for continuous home inotropic drug administration guidance and management. In addition, the academic significance of this report is that pharmacists play a central role in multidisciplinary collaboration through the optimization of infusion management and development of home transition protocols.

Regarding the effect of DOB administration on long-term prognosis, a subanalysis⁶⁾ of the FIRST trial showed an increased incidence of cardiac events, and the use of the lowest necessary dose and shortest duration is recommended. On the other hand, it has been shown that continuous administration of DOB at home in patients with end-stage heart failure may contribute to symptom relief and lower rehospitalization rates⁷⁾ and should be carefully determined after evaluating the patient's condition.

Reducing rehospitalization for heart failure and allowing patients to spend more time at home are signifi-

cant benefits, not only for the patient but also for the medical staff.

In this case, the pharmacist was actively involved in selecting an appropriate infusion pump for home transition, optimizing infusion management and preparation, and developing a home-transition protocol. In selecting an infusion pump, we compared CADD-Legacy and Cafty Pump S, and selected CADD-Legacy for its portability, dosing accuracy, and flexibility of settings (Table 1). In collaboration with the Department of Clinical Engineering, CADD-Legacy was loaned free of charge, reducing the financial burden on the patient. To optimize infusion management, a double-lumen PICC was utilized so that DOB and furosemide, which can easily

change their composition, were not administered through the same route. To standardize the frequency of cassette changes and the method of filling the DOB, we used 250 mL cassettes and continued filling from pre-filled syringes to simplify aseptic preparation. Furthermore, the procedures necessary for home transition and the implementation schedule were clarified through joint multidisciplinary conferences. An overnight stay test was conducted to evaluate the operability and adaptation of the pump to the home environment, and necessary modifications were made after providing feedback on problems. Currently, DOB and furosemide are not designated as injectable drugs that can be administered by insured physicians by the Min-

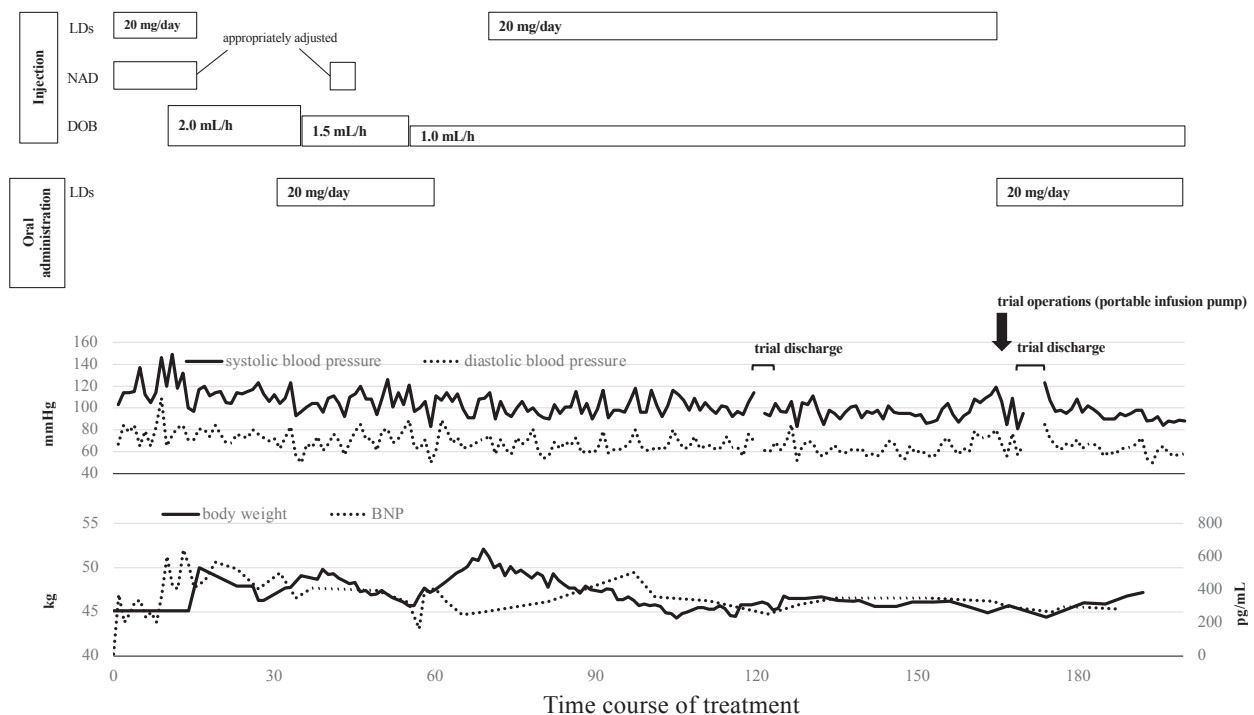


Fig. 1 Time course of treatment.

LDs: loop diuretics; NAD: noradrenaline; DOB: dobutamine; BNP: brain natriuretic peptide; AA: appropriately adjusted.

Table 1 Comparison of portable infusion pumps.

	CADD-Legacy PCA pump	Cafty pump
Power supply	Batteries or AC power	Batteries or AC power
Battery operation time	approximately 112 h (at 10 mL/h infusion rate)	Over 24 h (at 80 mL/h infusion rate)
Weight (body only)	Approximately 290 g	Approximately 340 g
Injection accuracy	Within $\pm 6\%$	Within $\pm 10\%$
Infusion rate setting range	0–50 mL/h	5–300 mL/h
Dedicated tube options	Three types (76 cm, 114 cm, 152 cm)	One type 210 cm
Dedicated infusion set	Available, medication cassette (50 mL, 100 mL, 250 mL)	Not available

PCA: patient-controlled analgesia.

istry of Health, Labour and Welfare, and thus are not allowed to be prescribed outside the hospital. In this case, the medication was prepared aseptically in the hospital, and the cassette was changed at the time of the home-nursing visit. In light of the future trends in medical fee revisions, a medical system capable of sustained administration must be established. In addition, patient management during home care involves not only heart failure, but also comorbidities, patient monitoring, and caregiver support.

Considering that the demand for home heart failure management will increase with the aging of the population, it is necessary to further strengthen multidisciplinary cooperation and the active involvement of pharmacists. This report is significant because it examines the role of the pharmacist in detail and presents a home transition protocol that can be applied in actual clinical practice. In the future, it will be important to accumulate more cases and standardize the administration of DOB at home.

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Consent Statement

Written informed consent was obtained from the patient for the publication of this case report, including accompanying images.

Conflict of Interest

The authors declares that there is no conflict of in-

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